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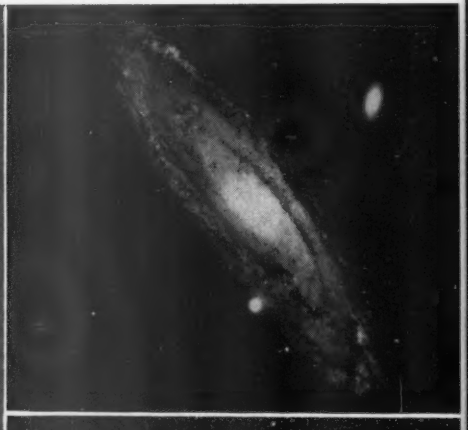
American Engineer

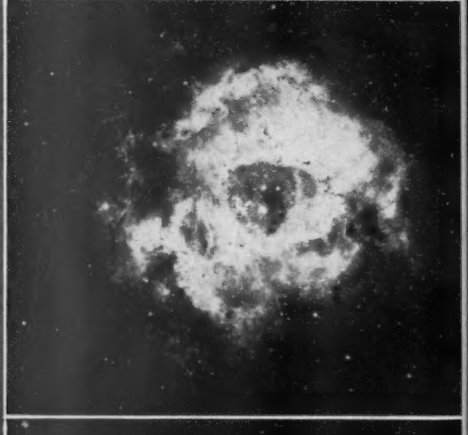
IN THIS ISSUE . . .

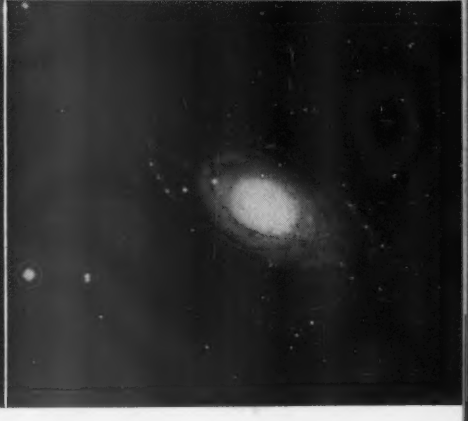
● THE RELATION OF FUNDAMENTAL RESEARCH TO ENGINEERING

By Vannevar Bush,

President, Carnegie Institution of Washington







Noted Engineer Vannevar Bush Writes About Research and Engineering

. . . *Also*

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A Professional Engineer At Yucca Flats

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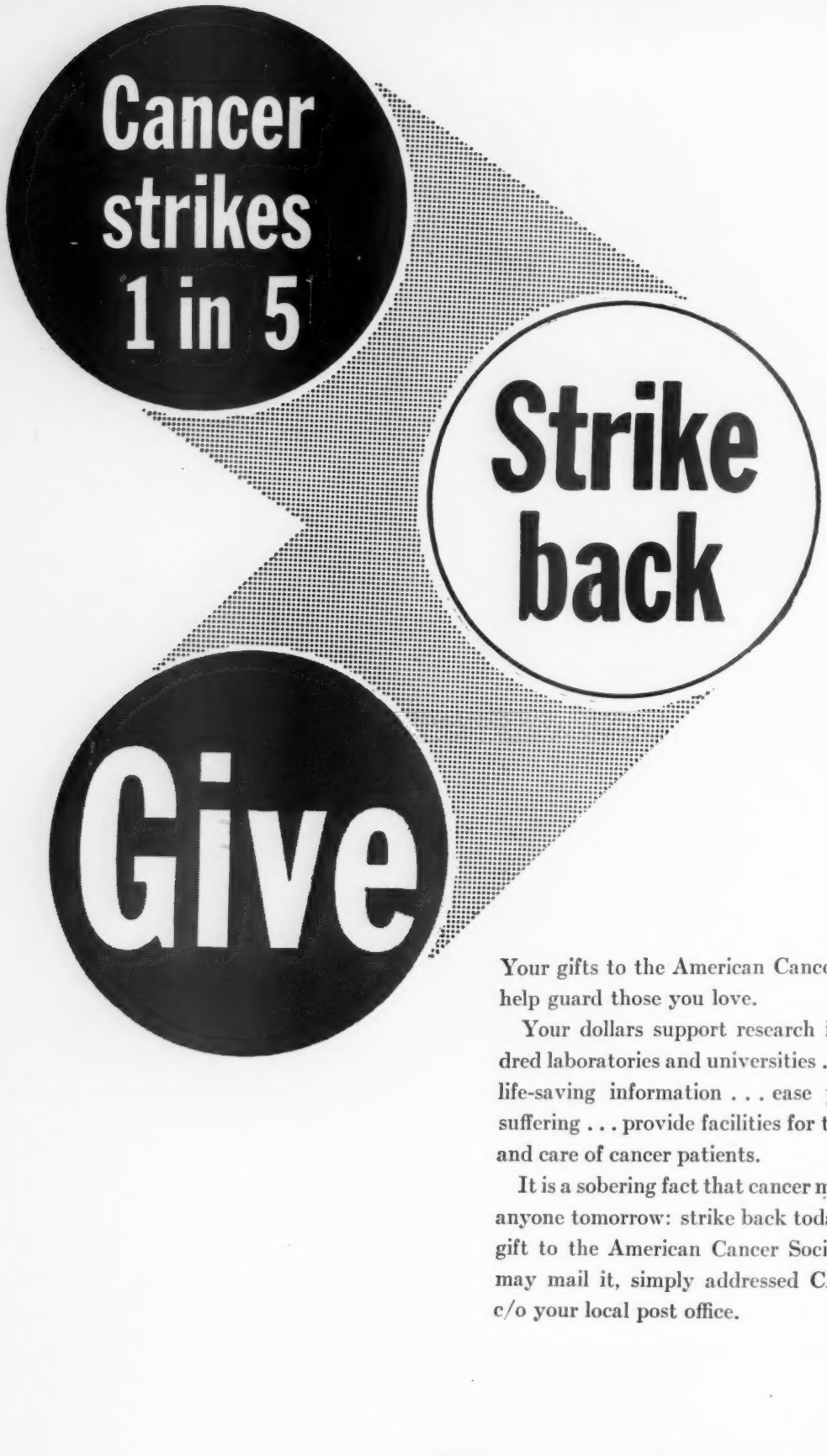

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Letters

Fish Story . . .

Dear Editor:

Mr. David A. Heller seems to have done a pretty good job (for an engineer) in picturing the plight of the Pacific Salmon versus Civilization. Like most engineers (salaam) he also reiterates the favorite theme song of the engineer (Oh hallowed word!) that they are responsible for every desirable thing that has ever happened up to and perhaps including the creation of the universe.

There are, in the Pacific Northwest for instance, a number of folks who do not entirely subscribe to that belief, particularly with reference to the anandromous fishes.

Mr. Heller described with reasonable accuracy part of the story concerning migratory species, and cites numerous instances where engineers (salute) and fisheries biologists have combined their talents to provide an acceptable substitute for nature. But, he completely omits reference to the fact that the engineer and his working aides have been *forced* to do these things by public opinion plus mandatory State and Federal legislation rather than by any inherent compassion for the preservation of these species for posterity. Nor has he made any reference to the groups and individuals who have carried on and still are battling night and day for the protection and wise use of all our renewable wildlife resources.

To an individual who has devoted half of his lifetime to the field of conservation it comes as a distinct shock to learn that the *fish can't get along without engineers* as the last sentence in Mr. Heller's article states. How then, in heavens name, did they ever survive the past 100,000,000 odd years of evolution?

How many salmon and steelhead and coastal cutthroat trout do you suppose we would have in our Pacific slope streams today if the engineers and others had been allowed to proceed with their original programs of damming, draining and otherwise abusing the environment of these fish?

Let the engineers take credit for carrying out plans, but let us not forget the guy who waded in and stayed in against great odds and insisted that it was fundamentally wrong to destroy a world-famous recreational resource and one of the basic industries of the region.

It has been said that dreamers are responsible for every comfort and luxury that we enjoy today and the engineer and craftsman bring these dreams to reality. I would like to hear what a fish has to say on the foregoing.

S. J. COUPER,
Salem, Oregon

► **For the record, Mr. Heller is not an engineer but a professional writer.—*Editor.***

Defense Bonds . . .

Dear Editor:

I am drawn to comment on the advertisement on the back page of the March issue of the AMERICAN ENGINEER—Defense Bonds. The subject of buying Defense Bonds has been kicked before the public in as many different ways and by as many different interests as anything sponsored by anyone in recent years. I have considered the wisdom of investing in Defense Bonds, but I can't make it come out. As for saving, there are the banks and credit unions. As for interest, the credit unions pay more than Bonds. That leaves one angle—the patriotic one.

If the government gets my money, I assume it is used to supplement tax money for running the government. There seems to be no shortage in the supply of the Bonds, so they must spend all of it. Of course, when the Bonds mature, they must be paid in tax money, of which the buyer pays a share. In other words, the buyer of a Bond is volunteering to pay future taxes, plus interest, and the government does not even have to go to the trouble and embarrassment of asking for these taxes.

Suppose nobody buys Defense Bonds. Is it a case of "No Defense Bonds sold—no defense?" No. They would have to increase taxes to pay for the defense. This would be the honest (and hard) way to get the money, and I believe it would be spent more wisely.

I have found that often tough engineering problems and cloudy issues resolve themselves if they are reduced to a point of absurdity. For instance:

Assume that I (the productively employed taxpayer) have an Uncle (Sam), not physically equipped for productive labor. He stays here at the house, and is very helpful in looking after things while I am at work. Since he has no income, I have arranged to give him a certain allowance (it amounts to about 25% to 30% of my income).

Several years ago my Uncle Sam began spending more than his allowance, and even though I increased it, he continued to overspend. I got to a point where I got sore when he asked for more. Then my Uncle Sam hit upon a way for me to save some money. I bought his I.O.U.'s. This arrangement not only gave me an opportunity to save, but it gave him the money to live more handsomely.

I'm a little worried, though. The other day I presented one of the I.O.U.'s to him for payment, and he said that I would have to increase his allowance so that he could pay it!

THOMAS H. WHITFIELD, JR., P.E.,
Savannah, Ga.

Help Needed . . .

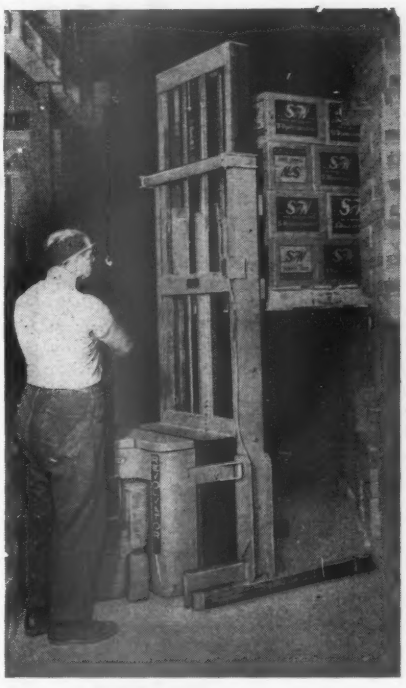
Dear Editor:

Those interested in the professional standing of engineers should get quite a jolt out of this: In the Cleveland *Plain Dealer* today, March 17, North American Aviation ran an employment advertisement listing in block or paragraph fashion six types of specialists, mechanics, and technicians. These were immediately followed by another which read: "Draftsmen and Design Engineers are required now to support the work of the technicians listed above."

This constitutes irresponsible depreciation of engineers in the public mind. Little by little reputations vanish; unless you are willing to speak up when it is challenged, you are sure to lose it bit by bit.

I have written their director of engineer-

(*Continued on page 5*)



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Whoever therefore would furnish assistance to the needs of individuals and people cannot rely upon the security of an impersonal system of men and matter, no matter how vigorously developed in its technical aspects.

Every plan or program must be inspired by the principle that man, as subject, guardian and promoter of human values, is more important than mere things.

—Pope Pius, XII

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SPECIAL ARTICLES

A Professional Engineer At Yucca Flats 8
By NSPE Past President L. L. Dresser.

The Relation of Fundamental Research to Engineering .. 13
By Vannevar Bush, President, Carnegie Institution of Washington.

Engineers Can Stop America's Greatest Waste 18
By Arthur Sanders, Nat'l. Assoc. of Scale Mfrs.

Engineering's Important At the Bureau 21
This Month's Photo Story

America's Roots By Gilbert E. Doan 24
Mr. Petroleum 26
Support of Engineering Education
By NSPE Vice President E. W. Seeger 27
Florida Scene of NSPE June Meeting 28
Late News Bulletins 30
NSPE Testimony On Taft-Hartley Law 42

REGULAR FEATURES

Letters 3
Professional News Briefs 6
From Washington 11
Special American Engineer Report 17
Strictly Business 25
Professional Postscripts 31
New Literature 33
NSPE Believes—Registration Requirement 34
Professional Directory 36
What's New—New Products of Interest 39

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Letters

(*Continued from page* 3)

ing personnel at 4300 E. 5th Ave., Columbus 16, Ohio, but I fear that if I am the only one who requests a clarification of their attitude, it will be of little avail.

How about it, will engineers stick up for their rights and reputations? Or, will they just sit back and enjoy what reputation others chose to let remain?

CARL H. GERLACH, P.E.,
Solon, O.

Salary Survey . . .

Dear Editor:

It is interesting and encouraging to note that some one in our Society, on the national level, is concerned about professional engineers' salaries as indicated by the "1952 salary and income survey."

I have just yesterday voted to show in "an opinion survey" that I am in favor of increasing dues to the National Society for public relations work.

Engineering by its very nature is a result of a need for a change. A change to improve, expand or keep up with the times. These changes cause peaks and low ebbs in the demands for engineers and often results in unemployment. This is true in industrial construction and related mechanical design fields of engineering. . . .

J. LOYAL MCCANDLESS, P.E.,
Pittsburgh, Pa.

Fairless' Article . . .

Dear Editor:

I was much interested in Mr. Fairless' March '53 article, "We Cannot Survive with Labor-Management Strife"—and was saddened that it winds up in failure. The problem is self-evident, but the author provides no solution.

We are told that the basic trouble is our failure in human relations, and inferentially, that success is impossible until we reform the nature of man. We are told that ending industrial warfare, via human relations, is a challenge to the finest minds in the land; that it will demand infinite patience and endless perserverence.

Permit me, with deepest respect, to differ with the author. It can be clearly shown that the strike is an Engineering problem, almost entirely, and that it has no more to do with human relations than 1,000 other problems that have been taken under control.

It can be clearly demonstrated that the strike would not be a challenge to the finest minds in the land if some of our very ordinary Engineering minds could have a chance to be heard. What is needed is an article on "An Engineering Solution to the Strike." I know several Engineers who could do a fine job on that.

Ben Fairless has done his best, but it is not enough. I submit that the Engineer should get him off this dead center—and he's well able to do the rest.

PILSON W. KELLY, P.E.,
Brooklyn, N. Y.

► **The *American Engineer* is interested in Engineer Kelly's article suggestion and will attempt to obtain such a piece for publication. For more on Mr. Fairless' article, see Professional Postscripts, this issue.—*Editor.***

Roman Roads . . .

Dear Editor:

With regard to your interesting Roman roads article, I would like to point out that there is little room for present day application. The Romans had a totalitarian society with slave labor, whereas we prefer a free society of individual initiative.

Our highway engineering problems today are very minor compared to the serious over-all problems of economics and political philosophy. The failure of our highway system to keep pace with the automobile is largely due to private enterprise in automobile production and socialism in highway management. Not only are the two incompatible, but socialized highways are incompatible with other transportation facilities which are privately financed and do more work (ton-miles).

The average American has been taught by fuzzy minded schoolteachers that highways are just "naturally" a government function, but in 1825 Thomas Jefferson did not think so.

If the cost of using our highways and supplying capital for them were to be balanced against use of them, the problem would partially disappear. For complete solution, transportation taxation must also be equalized so that impossible burdens are removed from non-highway forms of transport. One cause of our highway problem is the diversion to highways of traffic that can be better handled on non-highway facilities.

An urban superhighway is a classic example. Costing several million per mile to construct, the direct cost works out to 2¢ per vehicle mile on a well-travelled road, just for capital. The operating expense is about 9¢ per vehicle mile, or 11¢ total. In addition there is a cost to somebody of 2¢ per mile for terminal facilities. Total cost is 13¢ per mile, tax-free in so far as supporting the national defense is concerned. The highway user labors under the misapprehension that his costs are about 2 or 3 cents per mile, and keeps on driving while our cities press closer to bankruptcy trying to provide street space.

An urban passenger railway at present prices can be built to carry passengers at a cost of 1½¢ per mile, or 3¢ including deadheading and reserve capacity. This is only one-quarter the cost of providing highway facilities and in many cases provides faster service. In every case it provides safer service.

Unfortunately, the comparison does not end here. Private money that builds railways must get a 6% return. This implies another 6.5% for the income tax collector. Since the investment is likely to run six times the annual revenues on a present day project, this normal income tax on privately owned transportation will add 40% to the cost, politically lifting the 3¢ per mile production cost to 4.2¢. On a distance of 8½ miles or more, there would be added the 15% excise tax, inflating the cost to 4.8¢. Ad valorem taxes would probably peg the selling price at 5¢—just about double the economic cost, and double the imaginary cost of automobile operation, although still only three-eighths of the true cost.

Under these conditions, capital is unavailable for modernization and expansion of public transportation. Facilities are taken out of service as they grow old. Congestion on the highways mounts. It will never be possible to solve a problem when the most efficient facilities are scrapped and the least efficient are left to do the job. It will end in bankruptcy for the large centers of population and inadequate facilities for all.

The only way our highway problem can be solved will be for political policies to permit equality of competition among the various forms of travels. The public has two choices: 1) to socialize the public transport system as New York has done with attendant evils perpetrated upon the taxpayer, or 2) apply the principles of private enterprise to the highway system . . .

E. L. TENNYSON,
Youngstown, O.

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Professional News in Capsule Form

Associated General Contractors' Recommendations Reported ● Heart Surgeons Use Engineering Techniques ● Hoover Urges Withdrawal of Federal Government from Power Field ● Engineer Becomes Mayor of St. Louis ● Other Items of Interest

Of particular interest to engineers are two of the recommendations made by The Associated General Contractors of America at the organization's thirty-fourth annual convention held recently in Miami, Florida, March 23-26.

The first recommedation was that, in the administration of contracts and the inspection of projects in municipal and other public works construction, the administration and inspection functions should be supervised "by a competent engineer or by competent engineers in the same engineering department of the governmental unit."

Secondly, "because the salaries paid to construction engineers employed by municipalities and many other governmental organizations are not sufficient to maintain sufficient staffs of competent and trained personnel necessary to design and administer construction programs in the most economical manner," it was recommended that "engineers administering such construction programs be paid salaries commensurate with their responsibilities and commensurate with salaries paid by private industry."

* * *

Engineering techniques are bringing new hope to heart patients. At the American Heart Association's annual meeting, held in Atlantic City in April, a number of new mechanical appliances, utilizing hydraulic engineering principles to repair weak, malformed, or injured hearts were discussed. Most of the devices are still in the experimental stages, but through their use bold new methods for repairing the living human heart are being evolved.

One such development, described by Dr. Robert E. Gross of Boston, is a plastic "well" which allows an operating surgeon to cut into the heart without the disastrous loss of blood pressure that ordinarily makes heart operations so difficult.

Through application of this and other engineering techniques to heart surgery, it is expected that help will be found for victims of heart afflictions whose cases are now considered virtually hopeless.

Immediate steps should be taken to "get the Federal Government out of the business of generating and distributing power as soon as possible," said ex-President Herbert Hoover, speaking in Cleveland at the final session of the two-day diamond jubilee convocation of the Case Institute of Technology, April 10-11.

As initial steps in this direction, Mr. Hoover suggested that Congress should: cease making appropriations for more steam plants or hydro-electric plants solely for power; make no more appropriations for new multiple-purpose projects "unless the electric power is first leased" to private industry, or to cities, States, or State-managed regional authorities; and join with the President to set up a temporary commission on the reorganization of the whole Federal power venture.

The former President, who is an engineer, served as honorary chairman for the Case jubilee celebration.

* * *

An engineering professor on leave from Washington University has just been elected mayor of St. Louis, Missouri. He is Raymond R. Tucker, the Democratic candidate, who has a 20-year record in civic jobs, but for whom the mayoralty is his first elective office. The new mayor has previously attracted national attention for his service as anti-smoke director of St. Louis.

* * *

The National Science Foundation has recently granted $8,000 to George Washington University, Washington, D. C., for a scientific study of factors involved in traffic problems. The study, under the direction of Dr. Bruce D. Greenshields, professor of civil engineering, will concern itself with the unpredictable behavior of human beings, as well as with materials and forces involved in the science of traffic engineering.

* * *

I. F. Kinnard, a distinguished member of the Massachusetts Society of Professional Engineers and NSPE, has been awarded the 1952 Lamme Gold Medal for a member of the American Institute of Electrical Engineers who "has shown meritorious achievement in the development of electrical apparatus or machinery." Mr. Kinnard, who is the engineering manager of the meter and instrument department of the General Electric Company at West Lynn, Mass., was cited for "outstanding contributions in design and developments in instrumentation and measurements."

* * *

By 1960 American industry will have to invest about $200 billion, nearly as much as has been invested in the last 30 years, if it is to achieve adequate output, with the working force available, to maintain our high standard of living, according to Dean E. Carson, director of business research for the B. F. Goodrich Company.

Speaking before the Philadelphia Chapter of the National Industrial Advertisers Association, he pointed out that by 1960 the United States population probably will have reached a total of about 174 million. Because this increase will be mainly an addition to the consuming rather than the producing group, those at work will be faced with the problem of supporting a much larger number of people than in any previous period of our history. To achieve the necessary industrial productivity, therefore, Mr. Carson said, every American worker will have to be provided with more effective tools, which action will require the enormous $200 billion investment.

* * *

A major problem encountered in the Army's construction program, ac-

Need Help with an unfamiliar engineering problem?

Consult a specialist. Look in the Professional Directory, pages 36, 37.

cording to Major General S. D. Sturgis, Jr., chief of Army Engineers, is the difficulty in persuading civilian engineers "to work at government rates in the cold and rain of muddy French provinces, still on the old basis of '40 and 8;' or within the Arctic Circle; or under the scorching heat and sandstorms of North Africa, while they remain separated from their families."

Another related problem—retention on the job after recruitment for the entire period prescribed in the employment contract—is being met, said General Sturgis, by the careful screening of applicants and by making certain that prospective employees are aware of living and employment conditions before they sign up for a job.

General Sturgis' remarks were made at the recent convention of the Associated General Contractors of America in Miami.

* * *

The 1952 school year saw a 30.5 per cent increase in the number of freshman engineering students, according to a report recently compiled under the auspices of the Federal Security Agency. The 51,631 potential engineers entering college in the fall of 1952 represented the third largest class ever to matriculate in the engineering schools, exceeded only in the immediate postwar years of 1946 and 1947. It is, therefore, expected that, with normal withdrawals, transfers to other majors, and so on, the resulting number of engineering graduates in 1956 should be around 30,000.

* * *

Stanley Stokes and Roy P. Hart, both members of the Missouri and National Societies, were among the recipients recently of the Missouri Honor Awards for Distinguished Service in Engineering. Dean Huber O. Croft of the University of Missouri's College of Engineering, also an NSPE member, presented the awards at a special convocation.

Both men are graduates of the University of Missouri. Mr. Stokes is vice-president and chief engineer for the Union Electric Company in St. Louis. Mr. Hart is chief operating officer for the Missouri Pacific Railroad Lines.

In addition to the two NSPE members, Honor Awards were also presented to F. Gano Chance of Centralia, Mo., and Frederick K. Powell, Jr., of New York.

* * *

Felix E. Wormser, a construction and mining engineer of Larchmont, N. Y., and vice president of the St. Joseph Lead Company of New York City, has been nominated by President Eisenhower for the post of Assistant Secretary of the Interior in charge of mineral resources. A graduate of the Columbia University School of Mines, Mr. Wormser is a former member of the Munitions Board and was once associated with the Bureau of Mines. He has had extensive experience as a mining engineer in both the United States and Canada.

* * *

A new annual award in the field of photogrammetry has been inaugurated by the Bausch & Lomb Optical Company of Rochester, New York. Competition will be open to any regular student, undergraduate or graduate, in a recognized college or university in the United States. Awards will be based on papers of not more than 4,000 words describing a new use of photogrammetry or of photogrammetric equipment, or describing an adaptation or improvement in the use of the science.

The first prize is $100 and a three-year, paid-up membership in the American Society of Photogrammetry. There also are two second prizes of $50 each, plus one-year memberships.

* * *

The "human factor" represents the most important single aspect in any sound approach to accident prevention, according to Harold K. Kramer, safety consultant to the Farmer & Ochs Company, speaking before the twenty-third annual convention of the Greater New York Safety Council recently.

On the same theme, Glen F. Griffin, another convention speaker and director of industrial training for the National Safety Council of Chicago, advocated less emphasis on actual safety instruction of workers and more stress on engineering changes to correct hazards in industry. He stated that to provide a machine guard or eliminate a hazard through engineering advances created "relative durable" changes that could protect all future workers on the same job.

* * *

Of interest to the many engineers who have taken advantage of International Correspondence Schools courses is the fact that, on May 20, the Scranton institution will celebrate the enrollment of its six millionth student. The I.C.S. has been in operation for 62 years and currently has 125,325 active students.

* * *

In commenting upon the Westinghouse-sponsored Science Talent Search in the House of Representatives recently, Mrs. Edith Nourse Rogers of Massachusetts pointed out the high percentage of past winners who are members of the principal scholastic honorary societies. Of the 240 winners through 1947 (the majority of winners since then are still completing their basic college work), 74 are members of Phi Beta Kappa; 27 are in Tau Beta Pi the honorary engineering society . . .

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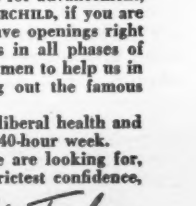
A Message to Engineers from Walter Tydon*



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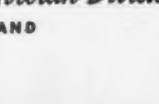
**Walter Tydon, widely known aviation engineer and aircraft designer and veteran of 25 years in aviation, is Chief Engineer of Fairchild's Aircraft Division.*



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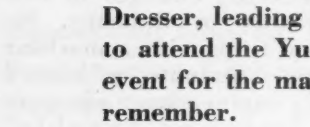
Editor's Note . . .

When the editors of the *American Engineer* learned that NSPE's Past President L. L. Dresser, leading Southwestern engineer, had been requested by the Governor of Oklahoma to attend the Yucca Flats atom blast, they lost little time in asking him to report on the event for the magazine. Here, then, is the tension-filled account, written in a style you will remember.



A PROFESSIONAL ENGINEER AT YUCCA FLATS

By L. L. DRESSER, P.E.,
Past President, NSPE

WHAT would you do, as an engineer and civilian, if you received notification in your office right this instant that an atomic bomb would be dropped on your town in fifty minutes or in no longer than ninety minutes?

That's the question every wide-awake engineer in any town in the world should ask himself today because that theoretical situation could become a horrible reality. If enemy bombers invaded our Canadian borders, it would take them only ninety minutes from the time they were picked up on the screens of radar interceptors until the bombers would be over my home town, Tulsa, ready to deposit their lethal loads. And if the bombers came from the direction of the Gulf of Mexico, my home town would have only fifty minutes' warning to prepare for an atomic blast.

"What would I do during that last few minutes before the bomb was dropped, making a flaming holocaust of the once-peaceful city and hysterical animals of the surviving citizens—all because of a lack of preparation?" This is the question that kept running through my mind during the last hour or two before I saw the recent atomic blast in Yucca Flats.

And as I stood there, watching the hours and then counting the minutes and then the seconds until zero hour, I began to realize that to an engineer, the atomic bomb is an even greater challenge than to the average citizen, who is seeking survival only for himslf, his family, and his friends. It is an enormous challenge because the engineers of our world hold the key to preparations. Every type of engineer—from the construction to the sanitation—must work together to prepare to offset the disastrous effects of an atomic blast on lives and property.

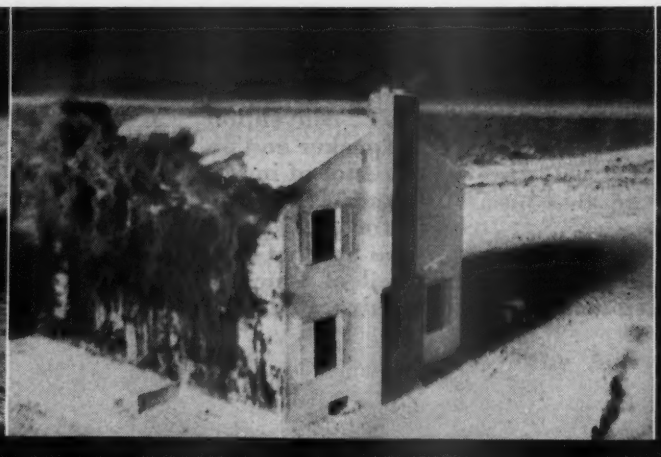
This enormous challenge to men in our profession had taken only a vague form when I first learned that I was to serve as an official observer for the State of Oklahoma at the atomic detonation at Yucca Flats on March 17. I realized that it was the first opportunity for a civilian to see and observe first-hand the awesomeness and the effects of an atomic blast. But I didn't think much past that.

SATURDAY, March 14, was spent in getting registered, certified, and cleared by the security personnel, and at 6:30 Sunday morning we were loaded into busses and taken over the 80 miles of hard-surfaced roads to the Nevada Proving Grounds at Yucca Flats.

Our morning was spent in inspecting "Doomtown, USA," the underground shelters, and the two model houses which had been set up by the government to study the effects of an atomic blast on an average community. One of the houses was located only 3,500 feet from Ground Zero, and the second at 7,500 feet from Ground Zero.

The houses were of frame construction, two-story design, with full basements. The basement walls were built of concrete blocks, and the floors of poured concrete. In each basement, identical shelters were constructed. These were built of wood and could be constructed by any householder. One was a lean-to type, which would hold three or four people, and was built of dimension lumber. The bottom of the lean-to was permanently bolted to the

Complete destruction of House #1 located 3,500 feet from ground zero, is shown in this series of motion picture photos.



floor, and the top was left just resting against the basement wall.

The second shelter in the basement was rectangular, about six by eight feet. The walls and ceiling were constructed of 2 x 6's, on 8-inch centers. These were covered with two layers of 1-inch shiplap, making a laminated sheathing.

The ground floor consisted of a kitchen, hall, living and dining rooms. House No. 2 was furnished with a bedroom suite, kitchen and bath equipment, and dining room furniture. The windows were covered with venetian blinds and drapes. There even were pictures on the walls. The top floor was that of a typical home with bedrooms, closets, and bath.

Life-sized manikins were seated in the living room and at the dining room table, and others lay on the beds. Manikins were also placed in the shelters in the basement.

Additional dummies were left in several shelters built out in the open and in the area between Ground Zero, plus 1,000 feet and 5,000 feet. Some of the shelters were built of concrete walls, floor, and room. Others were constructed of concrete cinder block walls, with a concrete slab for a roof. The roofs of these shelters were approximately two feet below ground level.

CARS were placed in the surrounding ground area, on circumferences at numerous distances, ranging from less than one-half mile up to two miles from Ground Zero. These were all late model cars and were placed at various angles to the blast direction. Some were left with the windows closed and others with the windows open. Manikins were placed in different cars, at the several test distances. All cars were in running condition and were filled with gasoline.

Trenches in which some 1,300 troops were to be subject to the blast ringed the test area, about two miles from Ground Zero. About 25 yards out in front of the main trenches was a much shorter trench in which the Federal Civil Defense Authority director, Val Peterson, some of the press, and the top military officers were to experience the actual effects of the blast.

The test which we were to observe was known as a low-level blast since it was to be detonated on a tower 300 feet above the desert.

The purpose of the test was to familiarize troops and give the public, through their directors of civil defense, a better understanding and knowledge of what happens when an atomic missile is exploded.

In addition, the government wanted to record the technical and mechanical, as well as the radiological, effects of the blast on the houses, automobiles, military equipment and personnel.

Following our inspection of the blast area, we were taken to Desert Rock Camp, where several thousand soldiers were encamped for the series of atomic tests. Following lunch, we were briefed on the military aspects and objectives.

The Author . . .

Mr. Dresser

Laurence L. Dresser, who was NSPE's president in 1951-52, is a native of Michigan and a civil engineering graduate of Tri-State College, Angola, Ind. He went to Tulsa as a structural engineer in 1924 and two years later formed the Dresser Engineering Company of which he is president. The firm's principal activity is the design and construction of petroleum and gas processing plants.

Mr. Dresser is a registered P.E. in five states—Oklahoma, Texas, Kansas, Arkansas, and Louisiana. In addition to participating in the city, county, and state civil defense efforts, he has been active in many other civic programs. He is a qualified pilot, but his main hobby is applying engineering principles to soil conservation and improvement on his 1,800-acre ranch in southeast Oklahoma.

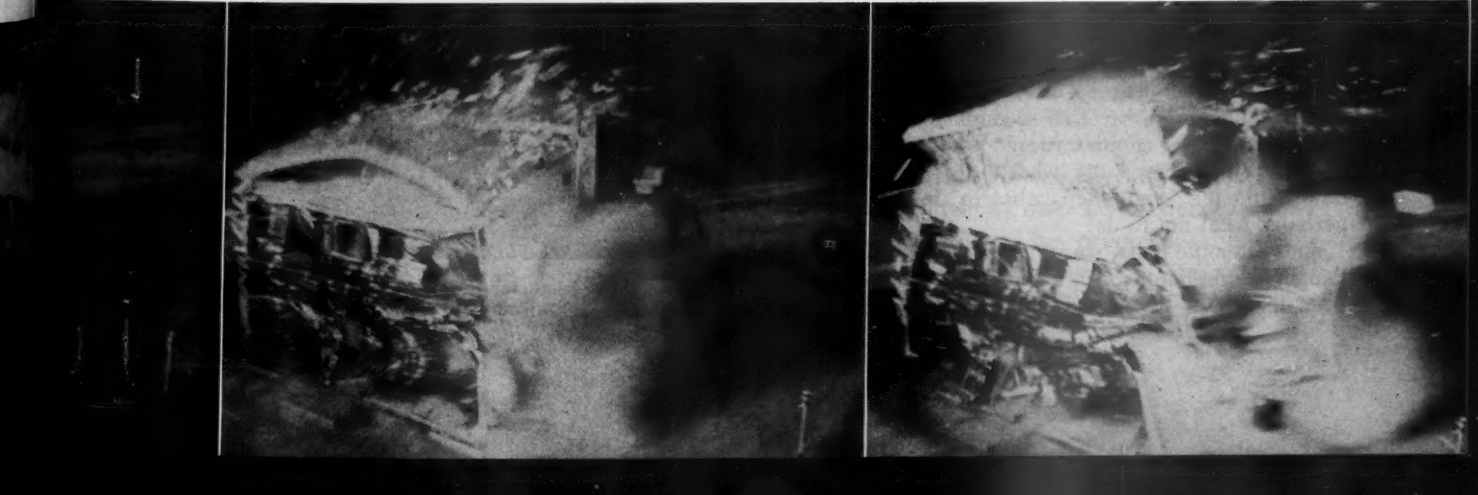
We arrived in Las Vegas about 6:00 p.m., tired, dusty, but becoming more excited as each second brought the time of the atomic blast nearer. We were briefed further on Monday when we became acquainted with the test organization, military forces, and maneuvers which would be made from Desert Rock Camp, as well as on the Air Force activities and their part in coordination with the ground forces. At Indian Springs Air Force Base, we saw the various types of aircraft which were capable of carrying atomic weapons. To my knowledge, this was the first time that such an assembly of aircraft has been presented for public review.

Tension had mounted to such a point Monday night that we did not even attempt to go to bed. We ate a late dinner, changed to field apparel, and then presented ourselves at the City Hall, from which the busses would depart shortly after midnight. By this time, the press, radio, television, and civilian observers numbered nearly 700.

WHEN the busses unloaded us at News Knob, located about seven miles from Ground Zero. It was about 4 a.m. A heavy wool shirt and a wool-lined windbreaker weren't enough to keep me from shivering in the chilly night.

The next hour and twenty minutes seemed endless as we milled about News Knob. Television and news camera operators set up their equipment, and we amateur photographers checked and then rechecked our cameras as the minutes lagged by.

It was still dark at 5:19 a.m.; only a faint tinge of pink had colored the eastern sky over the Rockies when the



public address system barked out the time. Then it began counting off the seconds to Zero—30—15—10—5, 4, 3, 2. 1. At Zero, the whole desert was illuminated by the blast. Since I wanted to take some color pictures of the blast, it was impossible to wear the heavy sun glasses that were issued. I stood with my back to the blast and counted off three seconds before turning to start taking pictures.

The first white light, which was accompanied by a perceptible heat wave, changed in a couple of seconds to a deep, angry orange. The silence was ominous, and then 30 seconds later, my clothing was whipped against my body, my lungs rattled, and there was a crack like a heavy artillery rifle, and the mountains began to rumble and reverberate. By that time, the atomic cloud had risen to considerable height and was mushrooming out toward the rising sun. Little could be seen on the surface as the whole valley seemed to be blanketed with a dense fog which, in reality, was dust, which hung over the area for hours.

It was not long after sunrise until the "egg beaters" started going into the troop area, bringing out selected personnel. The first one to be returned was Val Peterson, Federal Director of Civil Defense. Soon after, a number of the armed forces personnel began to arrive by helicopter.

While the immense fog-like cloud of dust hung over the blast area, only the technical groups were permitted to start inspection. They were flown in and then flown out of the area again as soon as they had made their preliminary inspection.

They brought out information that House No. 1 was demolished and blown from its foundation. This was followed by a report on House No. 2, where windows and doors had been blown out of the house and manikins scattered over the rooms, with the exception of those in the shelters in the basement, which appeared to be intact.

By 11:30 a.m., we boarded busses and were driven down into the blasted area. When we arrived about a mile and a half from House No. 1, we were permitted to follow the radiologist toward the house until radioactivity at three-quarters of a mile made it dangerous to advance any farther. We could also see House No. 2 from that vantage point.

As the busses returned from this area, we stopped to inspect several of the automobiles. The awesome force of the blast was testified to by the fact that even at distances of a mile and three-quarters and two miles, practically all cars which had been left with their windows and doors closed were found to have their tops crushed in—in the shape of a bathtub. Those cars in which windows were left open appeared to be intact, without any damage whatsoever. A number of the cars had been started and appeared to be none the worse for the experience.

THE evidence was that a car was a pretty good place in which to be, if not in the immediate area of the blast, and that occupants were not injured if they had left the windows open and had gotten down on the floor of the car.

There is little doubt that each of us who saw the bomb blast was awed by its power. Each of us had counted off the seconds with that mechanical voice over the loudspeaker as Zero neared. And we each wondered what would happen if those five seconds were being counted off in our own communities. What would people be doing? Would they know what to do? Would they know how to do it? And, then, what to do afterwards? Or, perhaps, what not to do.

And after the blast, we were still awed by the potential danger of the bomb; but, at the same time, our fears had been lessened. Instead of terror, there was respect and understanding — and a challenge to establish a defense which will protect and save many lives and much property.

If the civil defense organization takes advantage of the information it now has, our civilian population can establish a defense at home that will be as strong as that of our military forces. Should our enemies understand this, it is quite possible that they will be deterred from an aggressive war because of the realization that there will be two battlefronts: one, military, and one, civilian—and that we are ready for whatever may come.

Americans should recognize the fact that as long as there is uncertainty and irresponsibility among any nations in this world, we must be prepared for any eventuality, hoping that eventuality will never take form.

We can be prepared, and at an insignificant cost, by becoming informed as to what to do in the event of such an emergency and by accepting the challenge placed before each of us. Perhaps the engineer receives the greatest. His construction know-how is challenged by the need to provide facilities which will protect the individual citizenry, both at his home and at his place of work.

ALL phases of engineering, from construction to sanitation, can be utilized in the defense of the country to minimize damage to property and life.

To put it simply, it's up to the engineer, both as a professional man and a civilian, to prepare himself now: first, to help render less effective the actual damage of the bomb; and secondly, to do everything he can to get things back to normal as soon as possible.

The engineer can:

1. Help his local Civil Defense director to make surveys of buildings and shelters;

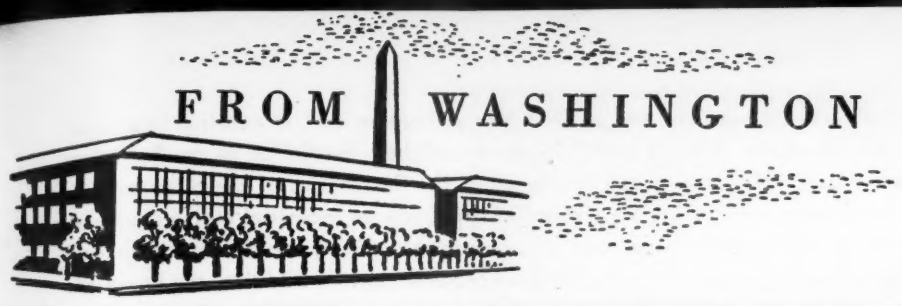
2. Help organize and inventory equipment for clearing the debris and for demolition or excavation work; and

3. Help develop plans to provide emergency utility service.

All of these can be provided with a relatively little cost in time, money, and training, if we plan ahead. And we must plan ahead:

It could mean the difference between survival and our becoming just a memory.—***End.***

This historic photograph taken at Hiroshima shows the secondary effects of flying glass and debris in the area.



By
Milton F. Lunch,
N.S.P.E.'s Legislative Analyst

The furore over the ousting of Dr. Allen V. Astin as director of the National Bureau of Standards has simmered down to a considerable extent following the decision of Secretary of Commerce Weeks to retain Dr. Astin for several months while a committee of scientists surveys the Bureau's operations. Likewise, the Senate investigation of the Astin case has been deferred. But Secretary Weeks is still determined to replace Dr. Astin with a director of his own choice. The last of the Astin case has not been heard and particularly of the basic issue which gave rise to it.

The more fundamental issue in the Astin case is whether the agencies of government should have a responsibility to protect the public from being defrauded or bilked through the offering of new products. The circumstances surrounding the Astin case point up this issue very clearly. The Federal Trade Commission, established under a 1914 law, has among other functions, the responsibility for the prevention of unfair or deceptive acts and practices including false advertising. In determining whether a product is falsely advertised the FTC calls upon the Bureau of Standards to conduct scientific tests and report the facts concerning the particular product in relation to the claims made for it by the seller. Upon the basis of this scientific evidence and other information the FTC makes it findings. Likewise, the Post Office Department relies upon the Bureau of Standards to conduct tests on products which are suspected of having been offered for sale through the mail on a fraudulent basis.

Whether the battery additive, which the Bureau found did not conform to the claims made for it, and which led to the removal of Dr. Astin, is or is not a worthwhile and useful product is an important question. But the more fundamental point was raised by Secretary Weeks when he questioned: "Should government, through regulatory bodies, the courts, and scientific agencies, test the merits of new products and the soundness of claims made for them, or should this function be left to the test of the market place?" The Secretary of Commerce agrees that when a product involves the public health or safety there is a responsibility to keep the dangerous and unsafe product off of the market. The pure food and drug laws are the outstanding example of the exception. But in his view, where this element is not present (battery additives, for example) the public should be the judge through its decision to buy or not to buy.

The underlying issue of the Astin case, then, is the philosophical and politically practical question of the role of government in connection with the offering of products, while the immediate and surface issue is the objectivity of the scientific operations of the Bureau of Standards. Inasmuch as engineers are vitally interested in the maintenance of the integrity of scientific tests, and as they constitute the major force in the development of new products, they will be keenly interested in the development of the facts and opinions on both of these issues.

* * * *

The President has taken a significant step in connection with the organization of government agencies dealing with the life-and-death question of mobilization policy, manpower utilization, strategic relocation of industry, and the stockpiling of strategic and critical materials.

Since the end of World War II the various agencies having responsibility in these areas have been ineffective to a considerable degree because of overlapping and confusion of primary missions. The result has been quite a jumble. The National Security Resources Board, for example, was established in 1947 to advise the President on various aspects of future military, industrial, and civilian mobilization. It was generally assumed that this agency would be a critical and important one and would be instrumental in establishing national policy in the fields mentioned above. Shortly after the Korean war commenced, however, the Office of Defense Mobilization was established and quickly assumed the dominant role in the formulation of basic policies. The National Security Resources Board has progressively become less important and in the past several years operated for a time without a chairman and then with an acting part-time chairman.

(Please turn the page)

In the military field, the National Security Act of 1947 (the unification law), in addition to providing separate departments for the Army, Navy and Air Force, established the Office of the Secretary of Defense and a Munitions Board. This latter group, made up of the Secretaries of the three military departments and a civilian chairman, was to act as a coordinating body on industrial matters, such as mobilization, the assignment of procurement responsibilities among the military services and preparing estimates of potential production, procurement, and personnel requirements. In addition, the Munitions Board had primary authority for the stockpiling of critical and strategic materials. Many observers have long felt that the Munitions Board serves no useful purpose in view of the broad responsibilities of the Office of the Secretary of Defense, and Defense Secretary Wilson recently gave voice to this view in describing the Munitions Board as a "fifth wheel" in the defense organization. The friends of the Munitions Board, with a touch of humor, have stated that of all people former motor magnate Wilson should know that a vehicle cannot run with only four wheels—it needs a "fifth wheel," namely, a steering wheel.

The President has now proposed a reorganization plan to Congress designed to cut through this maze of defense organization confusion, and his plan appears to be assured of approval. Simply, the President proposes to abolish the National Security Resources Board and reorganize the Office of Defense Mobilization into a permanent agency having responsibility for both present and future mobilization activities. At the same time, the reconstituted ODM will assume the stockpiling functions of the Munitions Board. The plan does not go so far at the present time as to include the abolition of the Munitions Board, but in view of Mr. Wilson's statement it would not be surprising if this step followed in due course. In his message to Congress, the President said that this arrangement "will permit better organization and management of the Federal programs relating to materials and requirements and will thus help to achieve the maximum degree of mobilization readiness at the least possible cost." The new ODM, which will now be the key agency in mobilization activities, except for the military functions, will be headed by Arthur S. Fleming, who has been acting director and is on leave as president of Ohio Wesleyan University.

A further significant development in the defense field—and one which has aroused considerable controversy—is the reported decision of Secretary of Defense Wilson to abandon the principle of a broad mobilization base. (See February, 1953, American Engineer). The theory behind the long-range defense build-up to date has been that it is essential to plan and place defense orders in such a way that maximum industry participation is obtained to insure that in event of total war the industrial facilities of the nation would be in the best possible position, from the standpoint of equipment, plant, and organization, to plunge into full-scale war production. In one of its last major recommendations, the previous administration proposed that this concept be enlarged and suggested the appropriation of 500 million dollars to advance the "broad mobilization base" concept.

The Defense Secretary is said to feel that this type of mobilization policy is too expensive and that more efficient production at less cost can be obtained by consolidating production in a few major plants. The current fracas over the ammunition shortages bears upon this question as there is some indication that ammunition production delays resulted from spreading the orders over a wide industrial range.

No sooner had Wilson's proposal become known than a howl of protest went up and the issue is now joined. One of the first to attack the "narrow base" idea was the Small Defense Plants Administration and members of the Senate Small Business Committee. They argue that the Wilson plan would wreck the present policy of aiding small businesses and would eliminate many small firms which are considered to be essential for production during a time of total war. Senator Richard B. Russell of Georgia, an influential member of the Armed Services Committee, commented that the plan presents the danger of plant concentration and that "our biggest plants would be the target for sabotage or air strikes. Any concentration of our production in such priority targets would be a tragic mistake." Others who may be expected to oppose the Wilson idea, either openly or behind the scenes, are the Office of Defense Mobilization and some key officials or officers of the military agencies.

Footnote to last month's From Washington Report on the Rickover case: President Eisenhower has approved a recommendation that Captain Rickover, the Navy's atomic expert, be kept on active duty for another year. This clears the way for Rickover's promotion to rear admiral by a special selection board ordered by the Secretary of the Navy.

A cyclotron at the Carnegie Institution's Department of Terrestrial Magnetism in Washington, D. C.

—Photo courtesy Science Service

THE RELATION OF FUNDAMENTAL RESEARCH TO ENGINEERING

By VANNEVAR BUSH,

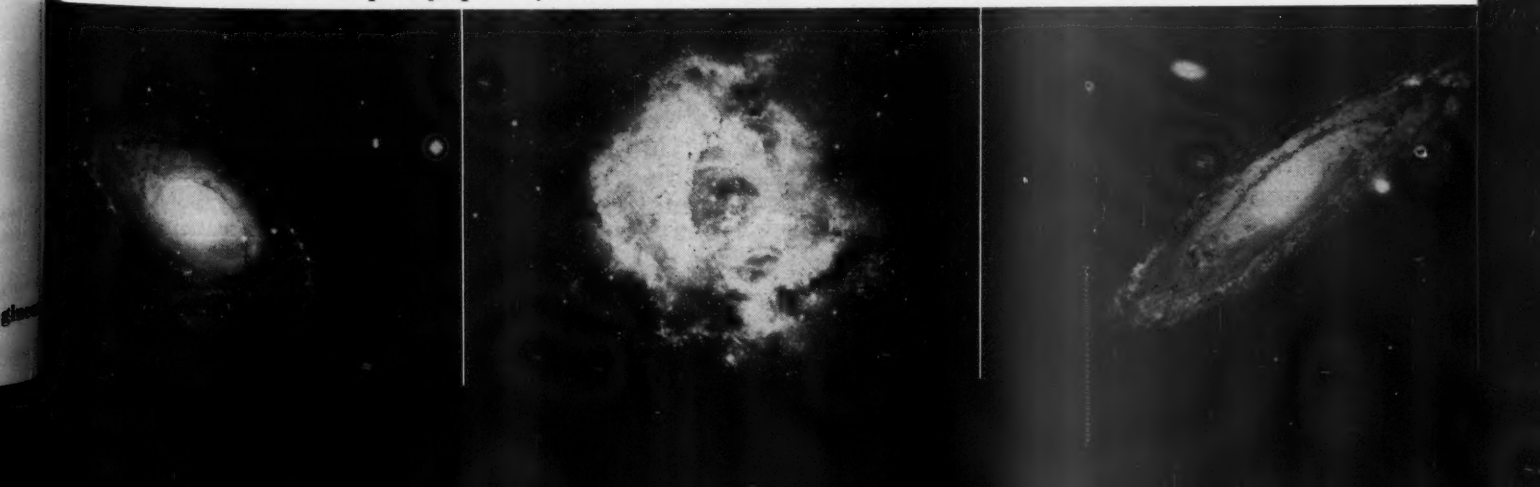
President, Carnegie Institution of Washington

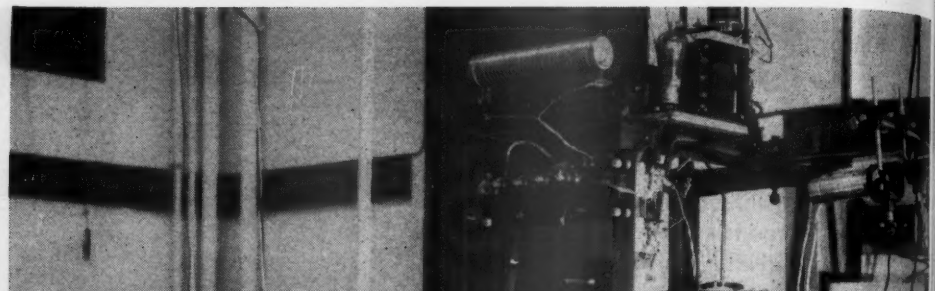
PROFESSIONAL men of science need to understand one another and clearly realize how all of us are essentially united in the service of mankind. This service is the common denominator of all true professions and must continue to be so among the sciences if they are to be worthy of support and respect.

Today we are at an interesting point in the progress of scientific research in the United States. If we can succeed in avoiding an all-out war and if we can maintain our economic system on a reasonably even keel, we may well expect that our engineers and scientists of all branches will secure for us remarkable benefits and advances leading directly to higher standards of living all over the world, the improvement of public health, the abolition of poverty, and increased leisure for all.

As engineers we may participate in the achievement of many concrete results in industry, and even in agriculture and medicine. And we shall hear of astounding additions to the cumulative store of knowledge of man and the universe, which may not find translation into immediate, practical applications, but which will nevertheless be important because the pursuit of science has a cultural value worthy of man's best efforts and because a research result, which is fully appreciated by only a handful of specialists at first, may be of great significance if it extends their efforts substantially toward their goal.

Nebulae as photographed by the Mt. Wilson-Palomar Observatories, a Carnegie agency.





This photo was taken at Carnegie's Geophysical Laboratory in Washington, and shows the apparatus for measuring heats of melting and other thermal properties of rocks and minerals.

The Carnegie Institution of Washington has been an important contributor to the march of scientific progress. This Institution was established by Andrew Carnegie on January 28, 1902, and was reincorporated by an act of Congress in 1904. It is independent of all other Carnegie agencies. For the half-century of its existence, its contribution has been primarily in the sphere of fundamental research; and its intention is to continue to operate in that sphere.

We have concentrated on studies in the general fields of astronomy, the terrestrial sciences, the biological sciences and archaeology. Our research work is carried on at the Mount Wilson and Palomar Observatories in Pasadena, California; the Geophysical Laboratory and the Department of Terrestrial Magnetism in Washington, D. C.; the Department of Plant Biology in Stanford, California; the Department of Embryology in Baltimore, Maryland; the Department of Genetics at Cold Spring Harbor, Long Island, New York; and the Department of Archaeology with headquarters at Cambridge, Massachusetts.

We collaborate closely with our neighbors. With the California Institute of Technology we are partners in the astronomical effort. Our embryologists work closely with the Johns Hopkins Medical School. In genetics we have close relations with the Long Island Biological Association. And there are many other collaborative relations.

All this may seem remote from engineering, but actually it is not so remote, for progress in applied science and engineering depends on the continuous accumulation of fundamental scientific facts. It is important, however, to keep the difference between fundamental and applied research clearly in mind. The difference lies not so much in methods and procedures, since all research is the systematic effort to gain new knowledge, as in motivation and objectives.

THE controlling purpose of fundamental research is to add piece by piece to our knowledge of ourselves and of the universe in which we live. This knowledge is sought for its own sake, and initially unrelated facts and observations are systematized into theories and generalizations, which help to clarify our views of reality. Fundamental research may and often does yield, or at least provide a basis for, important practical applications; but, for its purposes, these are usually incidental. Sometimes a more direct contribution to the practical application of basic research occurs when a scientist who has worked long in a special field lends his talents to a specific program of development, as was done by many staff members of the Carnegie Institution during the two World Wars.

The purpose of applied research is more definite and immediate. It seeks to produce new and useful devices, materials, or processes by capitalizing on the growing body of fundamental knowledge. The knowledge which applied research adds is how to render the fundamental information useful. Applied research starts, sometimes, with a new piece of fundamental knowledge and seeks its applications. More often it starts with a need, and plows through the whole range of accumulated knowledge to find the best way to meet that need.

When the economic factor enters and costs and the adaptation of production methods are considered, applied research merges gradually into engineering. The job of the engineering profession is that of applying science in an economic manner to the needs of mankind; and thus the chain of service linking the efforts of scientists and engineers is completed.

As members of an independently endowed organization, we of the Carnegie Institution feel that we are in a particularly felicitous situation for fundamental study—although dollarwise today we occupy a relatively small place in the whole scheme of American research. Research stands or falls by the men who are called upon to do it, and our staff is freer, in the best sense, than many other scientific groups.

The Carnegie Institution's devotion to fundamental research has simplified many of its problems and relations with persons and interests outside its immediate circle. We have, for instance, no great problem in our relations with industry, which are informal and friendly. Our laboratories are open; and competent, serious-minded visitors are always welcome. We promptly publish what we learn for the benefit of all. Patent matters are not

a subject of controversy with us, or even a matter of moment in our scheme of operations. When an invention occurs, a patent is applied for if this appears to be in the public interest. We feel that whatever is achieved in the laboratories of the Institution should be so treated as to result in the greatest possible public benefit and the means to that end should be examined critically in each particular instance.

To give a better idea of just how engineers and others seeking useful applications for basic scientific data profit from the work of the Institution, I shall cite a few case histories.

Although the objectives of the Geophysical Laboratory are entirely within the realm of pure science, occasionally the research in pursuit of them results in findings which have direct application to engineering problems. Thus the results of silicate studies at the Laboratory have borne directly on questions concerning the formation and properties of various kinds of glass, including optical glass.

During World War I, when American supplies of optical glass were especially low, research on the annealing of glass was carried on in the Geophysical Laboratory for the Government and led not only to the development of a simple empirical rule for the release of stress in plastic substances, but also to the development of a new annealing technique which markedly reduced the time required. The consequent optical-glass production program directed by Carnegie's Arthur L. Day for the War Industries Board supplied the Government with 97 per cent of the optical glass needed for war purposes. It also resulted in the permanent establishment of a new industry in the United States.

Further research in the annealing technique led to a modified formula used for the annealing of the Pyrex disk for the 200-inch Hale Telescope of the Palomar Observatory.

More recently the invention by George W. Morey of lanthanum and thorium borate glasses with high refractive index and low dispersion has led to the introduction of a new family of glasses of great importance in the manufacture of photographic lenses.

Another by-product of immediate practical utility has been the application of the thermal behavior of rock-forming oxides and silicates in the industrial field of refractories. New light was shed on refractories, such as firebricks, porcelain, and pottery, by the discovery of mullite and its identification as a crystalline substance formed when clays are heated.

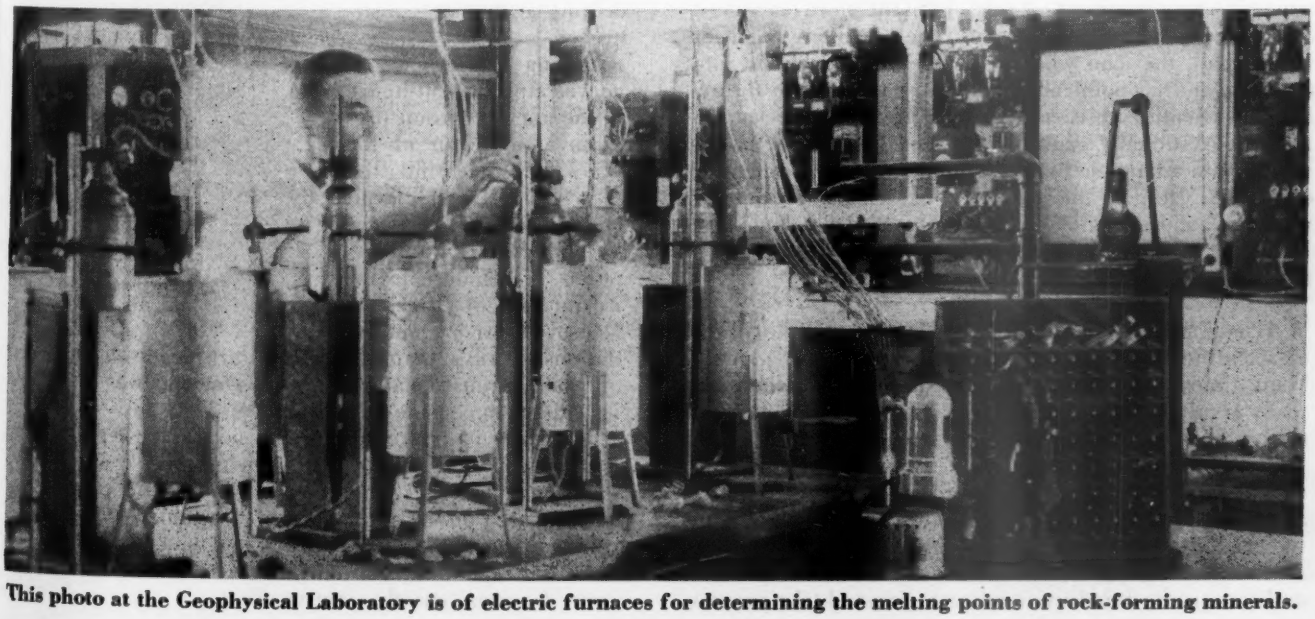
The Portland cement industry still looks upon a 1915 paper by G. A. Rankin, then a member of the Geophysical Laboratory, as a guide to the chemical phases of cement production. His work made it possible to predict the behavior of any mixture of lime, alumina, and silica so that the best composition of a cement for a given purpose can be determined before the product is tried out.

In the Department of Terrestrial Magnetism, as early as 1926, scientists were working to achieve direct measurement of the basic forces which bind protons and neutrons together to form all atomic nuclei. But the ultimate results and the still untapped potentials of atomic research scarcely need cataloguing here.

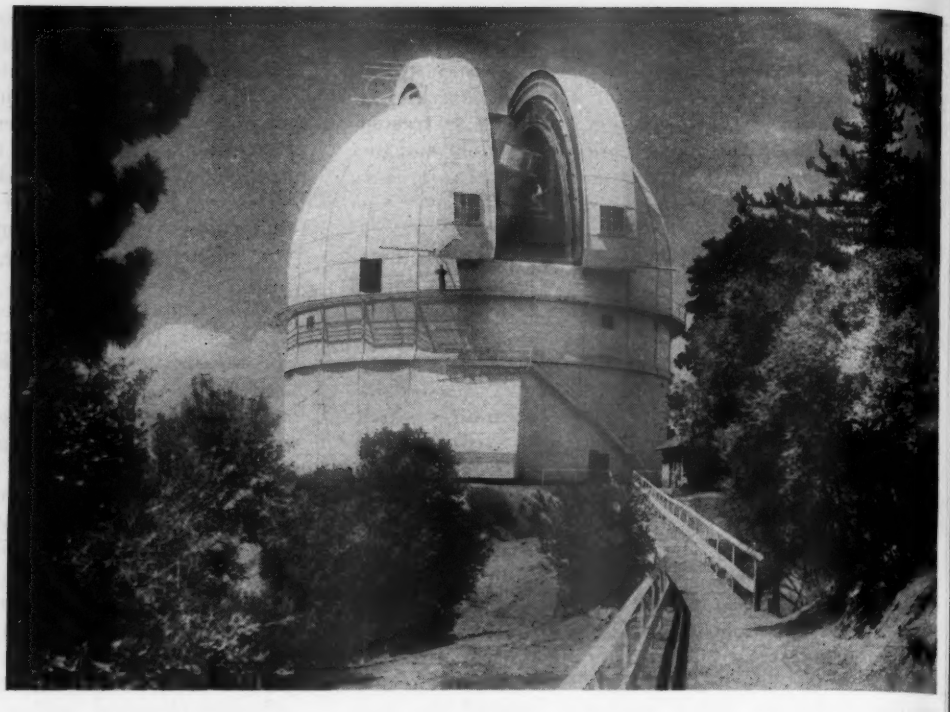
Out of our study of the ionosphere have come volumes of vital information about the propagation of radio waves. Though men of several countries worked on the practical development of radar and on the adaptation of radar equipment for specific and varied purposes, there is no doubt that the 1925 experiments of Merle A. Tuve and Gregory Breit, both of the Department of Terrestrial Magnetism, introduced the first use of short-wave electromagnetic pulses to observe anything whatsoever, the first effective electrical method of surveying the ionosphere, and the first observation of the echoes of pulses from airplanes. This was not the first detection of objects by electrical means, but it was the first radar.

We may reasonably expect that many other practical developments and industrial techniques of the future will come from the basic research of the Carnegie Institution and other comparable organizations. From the point of view of the nation as a whole, however, the gap between fundamental discovery and practical application is not always effectively bridged. Universities, institutions like our own, and the Government are the prime researchers today in the fundamental field. But it takes the resourcefulness and drive of competitive industrial effort to vault the many hurdles that are always in the way when novel methods or devices are to be introduced into our lives.

To introduce a new method or device requires the expenditure of venture capital, which is not available in the ordinary sense to public or semipublic institutions. There is nothing wrong about a fundamental idea's flow-



This photo at the Geophysical Laboratory is of electric furnaces for determining the melting points of rock-forming minerals.



The Mount Wilson Observatory. The dome of the 100-inch Hooker Reflector is shown from the south with the shutter open.

ing out of laboratories such as ours and later being exploited industrially if it is all done within the framework of the law and with proper regard for the public interest. We believe in free private enterprise in this country. But in our free enterprise system it is not entirely clear where the burden of initiative lies for bringing a promising idea to the point where it will be exploited. Sometimes, therefore, there is a long wait before industry on its own initiative takes effective action.

The Carnegie Institution is quite willing, when possible within its recognized limits, to carry particular studies beyond the first clarification of principles if this seems to promise material advantage to society and there is no immediate possibility of its being done elsewhere. But the gap still remains wide. The results of fundamental research need to be carefully and unerringly channeled so that developments most beneficial to mankind will be fostered and unpromising effort will be avoided. In achieving this end, I believe that the engineer can and must play a most important role. I am the more convinced of this because I am an engineer. The practicing engineer is, after all, the man who brings the general public into familiar, and economically practical, contact with the results of scientific research, and the area of his responsibility is continually growing. He must, therefore, be receptive and adaptable to change and to shifts of scientific emphasis. Despite the tendency of science to become more and more complex, he must avoid the danger of becoming over-specialized at the expense of versatility and resourcefulness.

THE engineer, in applying science, must show a flexibility of scientific outlook, and he must be willing to pioneer. Many times it will be for him to discern just where the really significant development lies as well as to determine the best means for its exploitation.

For this reason, it is no longer enough simply to recognize the essential kinship between fundamental research and engineering. The engineer must also interest himself in the efficiency of the media through which basic discoveries come to him. True science is a two-way street, and true professionalism involves a give-and-take process. The men and women who are now doing basic research want to see that their discoveries reach those who will apply them in the most expeditious manner possible. And the engineer must help them find the effective means of communication so that their joint efforts can bring about the maximum fulfillment of the promises for a more abundant life that are held forth by our increasing knowledge of man and the universe.—***End***

About the Author . . .

Dr. Vannevar Bush—electrical engineer, educator, writer, and administrator—has been President of the Carnegie Institution of Washington, D. C., since 1938.

A native of Everett, Mass., he received his B.S. and M.S. degrees from Tufts College and his D. Eng. from M.I.T. From 1932 to 1938, he served as Dean of Engineering at the latter institution.

Dr. Bush

During World War II, he was a prominent figure in the nuclear fission program as Director of the Office of Scientific Research and Development. His 1945 report, *Science, the Endless Frontier*, prepared in response to the request of President Roosevelt for recommendations on ways to apply OSRD's wartime lessons in times of peace, aroused nation-wide interest and was reflected in legislation considered by Congress.

Dr. Bush had received patents on gaseous-conduction devices and on cathode arrangements and coatings for grid-controlled arcs. His chief inventive interests have been focused on the application of electronic and mechanical means to reducing the burden of computation, calculation, and repetitive routine in order to free man's intelligence for more strictly creative effort.

An *American Engineer* SPECIAL REPORT

Re: Industrial Research and Development Study Made by the Departments of Defense and Labor

● "Industrial Research and Development: A Preliminary Report," has recently been released by the Department of Defense's Research and Development Board and the Department of Labor's Bureau of Labor Statistics. The 42-page booklet, offering the first results of an RDB survey of private industry conducted from May to August 1952, presents data on the cost of research programs, the numbers of engineers and scientists employed, the ratios of research costs to sales, the average cost of research and development per research worker, the turnover rates for engineers and scientists, and the liability of such professional research personnel to calls for military service.

The survey covered approximately 85 per cent of all industrial research and development carried on in 1951 and was participated in by about 2,000 companies. The total cost of the research for all the reporting companies was nearly two billion dollars during 1951. Close to half of it was financed by Federal Government agencies, for the most part by either the Department of Defense or the Atomic Energy Commission. In releasing the report, it was also announced by the RDB that the national outlay for scientific research and development for 1952 totaled more than 3.5 billion dollars, with about two-thirds of this sum devoted to work performed in laboratories and other facilities owned or operated by private industry.

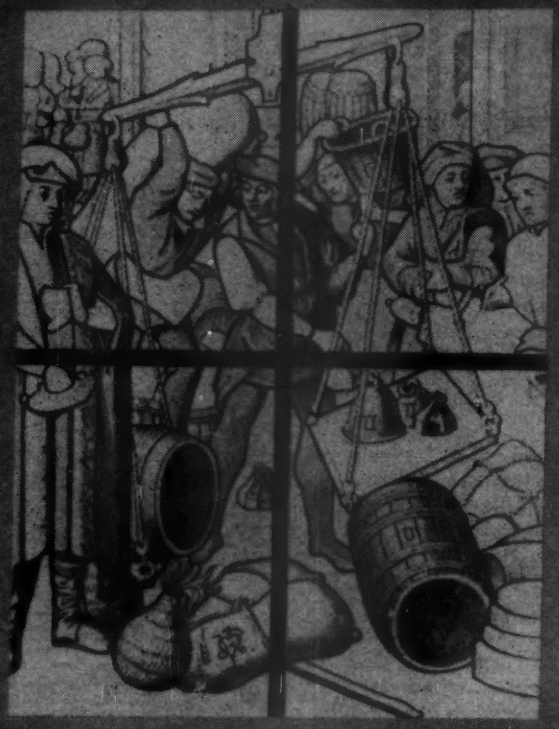
Nearly 94,000 research engineers and scientists were carried on the employment rosters of the reporting companies as of January 1952. Almost 90 per cent of the 94,000 were working for companies whose main business was manufacturing, and three branches of manufacturing—the electrical machinery, aircraft, and chemical industries—together employed 55 per cent of all engineers and scientists included in the study. More than a third of the engineers and scientists were employed by the less than 20 companies with professional research staffs of 1,000 or more; while, in contrast, less than two per cent were in the employ of the 600 plus companies that reported fewer than five professional research workers on their staffs.

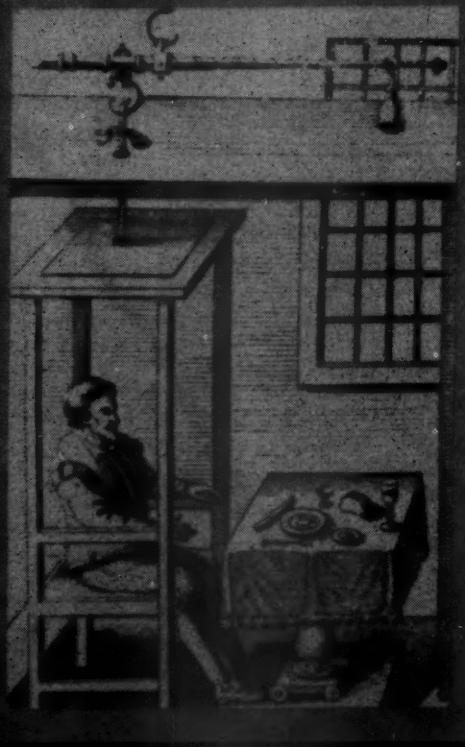
Of particular interest to NSPE members because of the second executive survey, "How to Improve the Utilization of Engineering Manpower," is the data on supporting personnel. Approximately 140,000 technicians and administrative and maintenance workers were employed in support of the 94,000 engineers and scientists. The industries that had the largest numbers of the professional research workers also employed the largest proportions of supporting personnel, and the greatest concentrations of these supporting employees were found in the relatively few companies with the most extensive research programs.

The rate at which engineers and scientists leave their jobs for other positions or service in the Armed Forces has assumed an importance during the past two years equaled only in the World War II period, the RDB report points out. According to the survey, the number who left the research staffs of reporting firms during 1951 averaged 16.4 per 100 employed at the end of that year. In most industries the separation rate was fairly close to this average figure; but in petroleum refining there was only an 8.8 turnover per 100 research engineers and scientists, whereas in the aircraft field, where there has been great competition for engineers and scientists since the start of the Korean War, the rate was 20.8 per 100. No consistency was noted between the turnover rate and the size of a company's research program.

The annual rate of separations for military service was only 3 per 100 workers, of which Reserve calls accounted for 1.8 and Selective Service for 1.2. However, although the service calls did not cut deeply into the national supply of research engineers and scientists during the period covered by the survey, the effects of a full military mobilization could be much more serious. As of January 1952, 19 per cent of the engineers and scientists included in the study were members of the Reserves and the National Guard and were therefore liable for service whenever needed. Another 6 per cent were classified 1A or 2A by Selective Service; that is, available for service or granted temporary occupational deferments. These two groups totaled about 23,500 of the 94,000 professional personnel on which the RDB received reports. The two industries with the largest defense research programs appeared most vulnerable to military call-ups, with 34 per cent of the engineers and scientists in the electrical machinery industry (including most electronics research) and 29 per cent of those in the aircraft companies subject to duty.

The results of the survey also indicated that, if necessary, industry could further expand its defense research program, with about 70 per cent of the companies indicating their ability and willingness to take on new defense research contracts.





◀ **The top drawing in the panel at the left shows a medieval weighing operation. In the center is shown a Dutch merchant weighing fruits for a customer. And in the bottom drawing Santorio Santorio, celebrated Paduan professor, 1561-1636, is depicted making experiments in digestion by weighing himself after a meal.**

Engineers Can Stop America's Greatest Waste

By ARTHUR SANDERS, Executive Secretary,
National Association of Scale Manufacturers

In the year 1830 an American engineer named Thaddeus Fairbanks, an inveterate inventor who loved to rig up mechanical gadgets, dreamed up something new that changed the industrial history of the world. It was a weighing device—a platform scale.

Prior to Fairbanks' invention, the development of the scale had progressed little from the time of the Pharoahs of ancient Egypt. When someone wanted to weigh a wagon load of hemp, for example, the hemp had to be laboriously unloaded and weighed in small bundles. Then the sums of the partial loads were added and the total was the weight of the entire load. It was costly, slow and tedious. With Fairbanks' new invention, the farmer could drive his loaded wagon on the scale and have it weighed. Then the unloaded wagon was weighed. The difference was the pay load of the commodity.

It seems a simple invention, but it changed history. One of the most important things it did was to save time

by eliminating a bottleneck. Today the American scale industry, one of the most heavily engineered of any on earth, has contributed greatly to the furious pace of modern mass production by allowing industrial weighing to be carried on at a rate never dreamed of. In no other nation is material measured by weight so fast or so often as in America.

Although industrial weighing is a matter the layman usually takes for granted, if, indeed, he ever thinks of it at all, it has a dramatic story to tell of especial interest to engineers. Engineering has revolutionized industrial weighing, and it, in turn, has revolutionized our system of mass production and distribution. It is literally true to say that our present high standard of living depends upon it.

The weighing balance itself, of course, goes back far beyond the dawn of history. The ancient Egyptians used it and the Bible contains many expressions like "being weighed in the balance." A painting in the year 1023 done in the Monastery of Monte Casino shows a tradesman using a beam balance, which is quite similar to many in use in industry today. But, though its roots go far back, the industrial scale is primarily an American institution of modern vintage. And the credit for its development must go to America's engineers.

...And Abraham weighed unto Ephron the silver."

Genesis 23:16

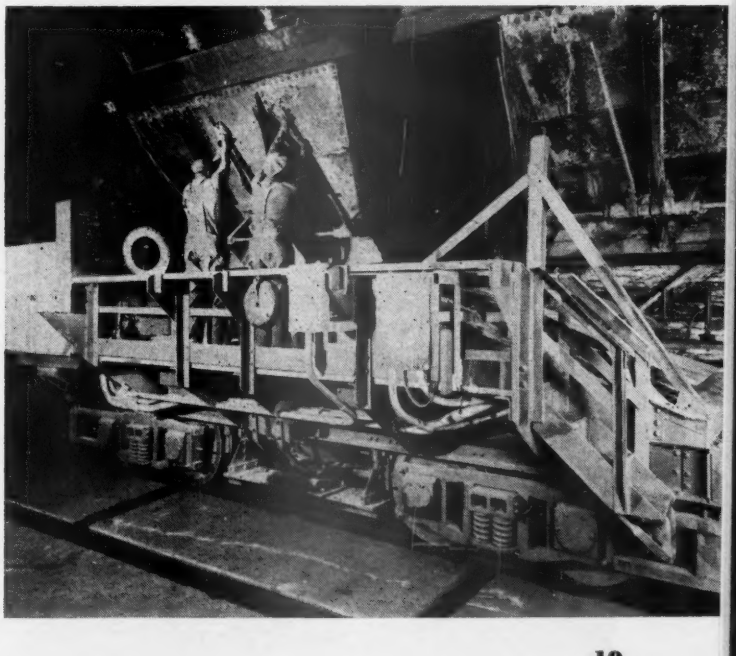
OUR distinguished First President, George Washington, recognized the importance of a uniform system of weights and measures in his first message to Congress in 1789. "Uniformity of currency, weights and measures is an object of great importance, and will, I am persuaded, be duly attended to," he said. Washington's classification of weights and measures with currency is interesting, for it shows that even then weight was recognized as one of the common denominators which keep our economy going. And, of course, trade and barter was carried on among primitive peoples, primarily on the basis of weight, long before currency was ever developed.

It is a pleasure to accept the invitation of the editor of THE AMERICAN ENGINEER to discuss a few matters relating to the nation's weighing problems. They should be of particular interest to registered engineers and engineer-executives, because faulty scales are the cause of one of America's greatest losses to industry, estimated at about two billion dollars yearly. The engineer-executive who possesses a little elementary scale know-how in addition to his other qualifications may well save his company substantial sums of money and bring favorable attention to himself.

The great industrial loss which engineers can do much to guard against by a little scale consciousness is the giving of overweight. The chief methods engineer of General Mills, Inc., Mr. Fred Blumers, recently pointed up the problem in a talk before the National Scale Men's Association. Remarking that tiny errors in overweight can lead to fantastic losses, Mr. Blumers said that if a single scale weighing 7-ounce packages of breakfast food consistently gives as little as one-eighth ounce overweight, the loss from that scale alone per year would amount to more than $100,000. If a single scale weighing pack-

With the aid of the engineer, industry has produced scales like this which can distinguish the weight of a mosquito before and after a meal of blood. The scale is so accurate it will weigh down to 1/100 of a milligram.

This huge mobile scale is used in mixing large quantities of material together. Scale industry engineers have created scales that make our production system possible both in speed and accuracy.



ages of flour were to give one-half ounce overweight, Mr. Blumers said, the loss could amount to half a million dollars a year for that scale alone.

On the other hand, the losses which can be incurred by giving underweight can be even more fantastic. Consider the unfortunate case of a big Illinois dairy which shipped a carload of butter to a large midwestern city recently. The city sealer found it to be slightly underweight and ordered every one of the thousands of pounds in the hands of wholesalers and retailers rounded up and shipped back to the processor. This cost the dairy large sums for handling, shipping and reprocessing, and then more for repackaging and reshipping. In addition, it cost them the good will of many wholesalers and retailers. The allowable margin of underweight in most states is set at 1% by law.

The moral is that scales have to be exactly right. Even small errors either way can be very costly.

One of the fallacies too many people hold is that a scale is giving correct weight if its indicator rests at zero when there is no load upon it. Without a test, such a situation is no indication whatever that the scale is accurate at other than the unloaded zero position.

One of the commonest causes of giving overweight, and one that engineers will readily appreciate, is the build-up friction in a scale. When new, pivot and bearing edges are sharp and almost no friction is present. However, with wear and hard usage, these edges become dulled and friction increases. This almost always works to the heavy monetary disadvantage of the weigher, since it takes a greater load to reflect any given weight on the scale. When small amounts of error result in large money losses, it pays everybody to be alert for friction. Repairs or replacement of the scale are small items, indeed, compared to the damage an overweight scale can do.

It's odd, but many engineers forget that a scale is only a piece of machinery like a motor. The big difference is that a motor won't work until it's fixed, whereas a scale will usually continue operation—with disastrous results.

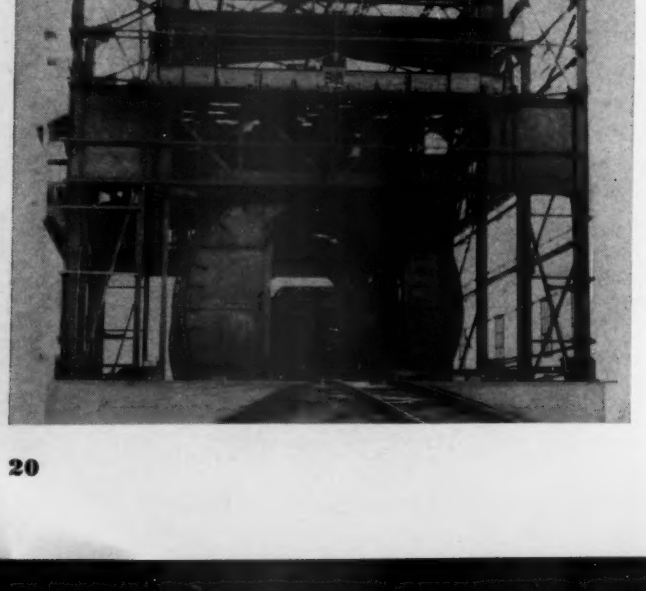
Thanks to the genius of America's engineers who have come up with many new applications and designs for industrial scales, this unsung servant of mankind is taking over all kinds of new jobs which formerly required human manpower. Many of these new tasks have saved management large sums of money, since human labor is usually the most expensive kind.

One interesting new use of scales was discovered by a major cigarette company which gives coupons with every package. Millions of coupons were constantly arriving in the mail and counting them proved a tedious, expensive operation, since human manpower was used. Using sensitive bench and computing scales, however, the coupons are now counted by weight more accurately, cheaper and faster than they were ever counted by hand.

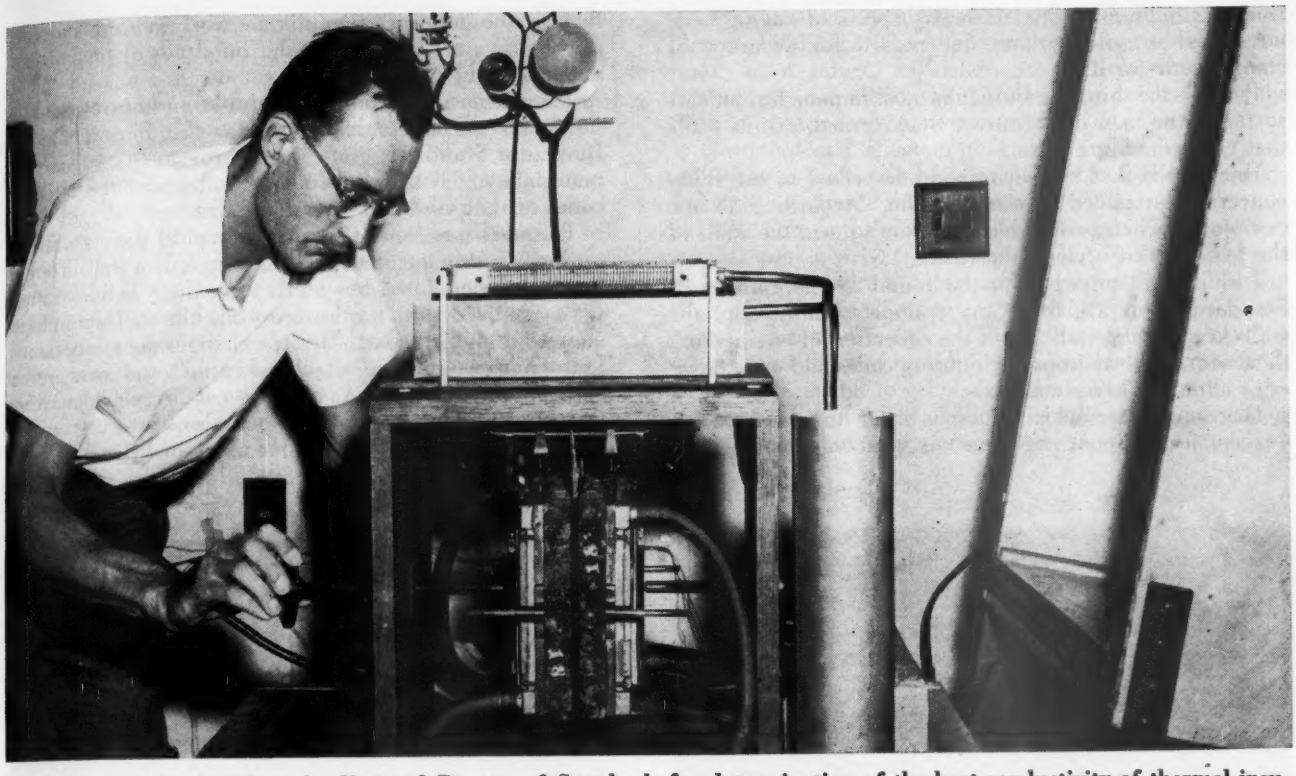
Since the cost of handling material is today nearly as high or even higher than the cost of all other items in its manufacture, many materials handling engineers are making a specialty of specially-designed scales for particular jobs. The principal cost of the weighing operation is not the scale, but the cost of time and labor used. The most expensive method to weigh material may be with an obsolete scale or one that was designed for some other type of weighing operation.

Aircraft engineers are very much aware of the critical role weighing is playing in aircraft manufacture. Since weight is an all-important factor in airplanes, many procurement contracts provide for a weight limit as well as demanding that the plane meet all engineering specifications. The finished aircraft, as well as being tested for performance, is weighed, and a penalty assessed for every pound overweight. Weighing one of the monsters of the air being turned out nowadays is an exciting and intricate task. To guard against overweight penalties for completed planes, aircraft plants weigh most of the components and use great numbers of scales to weigh parts, even down to the small screws.

Other jobs which scales have taken over are inventory control, batching, grading of products by weight, the issue of stock, the pay for piece work, freight and express charges, testing, measuring the torque and power of engines, determining the centers of gravity, computing the ratios of two materials mixed together—and literally a million and one other jobs. Whatever the problem is, today's industrial scales can probably handle it—thanks to the genius of engineers.—***End.***



A railroad gondola and its contents are weighed in this mammoth scale. The scale has played a major role in man's progress through the ages. Earliest recorded history bears witness to its use to give honest value and fair exchange. Of course the 20th century scale shows little resemblance to its early predecessor. But despite its crudeness and rough beginnings, society had an organ that was to contribute materially to the advance and developments leading to our modern era.



Apparatus developed at the National Bureau of Standards for determination of the heat conductivity of thermal insulating material. This assembly is now being used at the Bureau in a cooperative program for standardization of the test equipment and methods of other laboratories.

The Walls Come Tumbling Down

ENGINEERING'S IMPORTANT AT THE BUREAU

• *An American Engineer Photo Story* •

Long a little-known agency of the Federal government, virtually unheard of except by scientists, engineers and similar professional people, (unheard-of, that is, as far as the man in the street is concerned), the Bureau of Standards has recently been catapulted onto the front pages of the nation's newspapers by the controversial dismissal of Dr. Allen V. Astin as its Director. (*See page 11 for more on Astin case.*) The interest aroused makes this an opportune time for American Engineer readers to take a closer look at the Bureau of Standards and at some of the things it does.

The Bureau is small as government agencies go. Its staff is about 4,600 and its annual budget is less than ten million dollars. Founded 51 years ago, the Bureau has come to be the focal point of the Government's fundamental research in physics, chemistry, mathematics and engineering.

During World War II it contributed greatly to the perfection of the atomic bomb, and the proximity fuse, and made major contributions on guided missiles and radar, among many other things.

As its name would suggest, the Bureau of Standards develops standards for, and runs tests on, materials purchased by the government. It also has had tremendous influence on building codes. (More about that later.) At the behest of the Federal Trade Commission or other government agencies, the Bureau of Standards runs tests on materials submitted to it. The FTC is especially interested in the

These two downtown Washington, D. C., buildings were scheduled to be demolished so the Bureau of Standards arranged to set them afire in a burnout test to help collect data for building codes.

Bureau's findings on materials it suspects of having been advertised or sold without due regard for accuracy of claims made for it.

Perhaps the thing the Bureau is most famous for, at least so far as the man on the street is concerned, are its walls that come tumbling down.

One recalls that a great miracle described in the Bible concerns the fabled city of Jericho. According to the Scriptures, when Joshua blew his ram's horn, the walls of the besieged city fell to the earth.

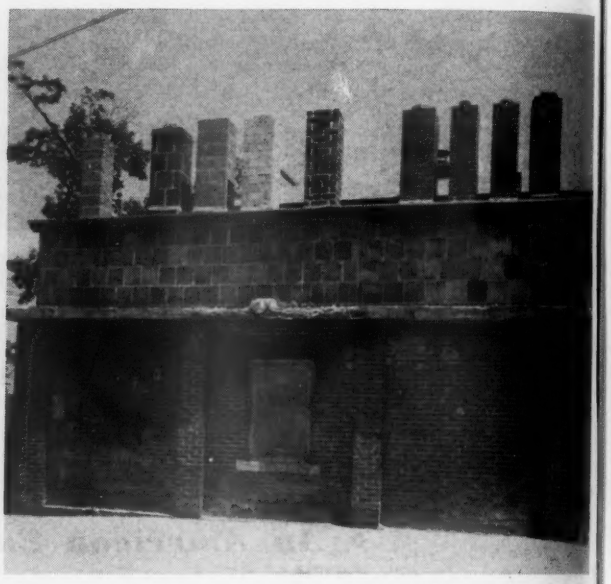
Joshua isn't anywhere to be found at the Bureau of Standards. Nor are there any trumpets handy. But the walls keep falling—all this in the collection of engineering data with which to improve building codes and our knowledge about building materials.

One nightmare which doesn't occur to many people (except professional engineers) is what might happen to them if the buildings they live or work in were suddenly to collapse and bury them under hundreds of tons of steel and concrete.

The reason is, of course, that building failures are rare nowadays. Considerable credit for this must go to the Bureau of Standards' tests and improvements on building materials which have profoundly influenced the building codes of thousands of American cities.

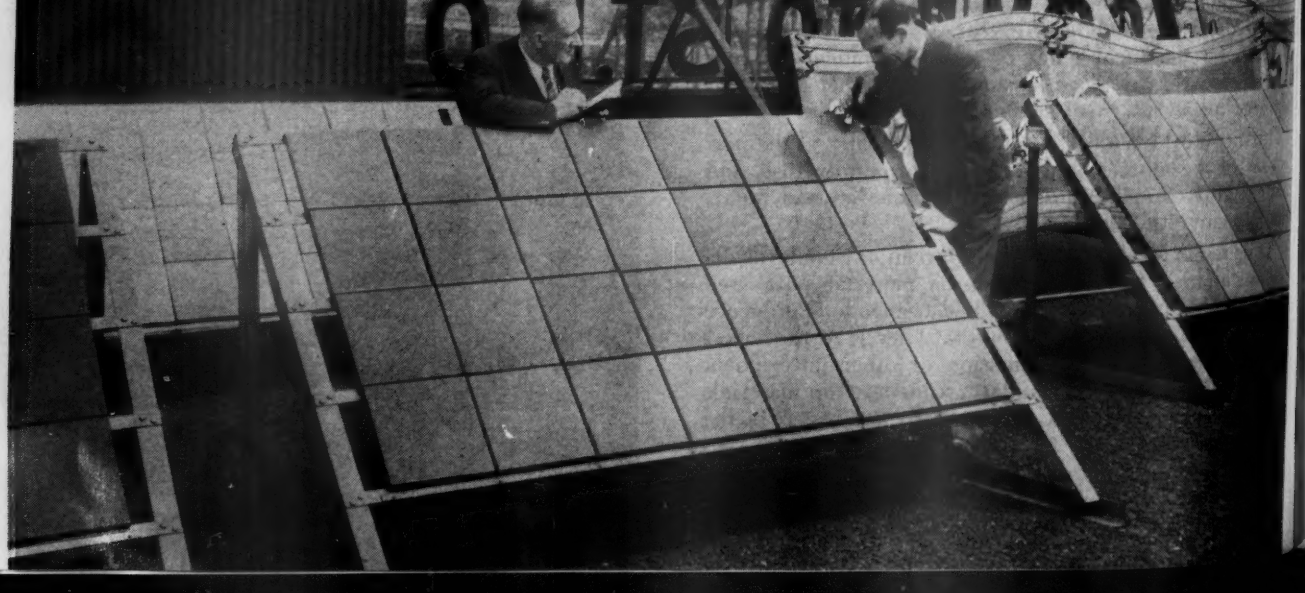
The tests are continuous. In a typical day, a crew of workmen, using the finest materials, puts up a wall. They're good workmen, but a few hours after their wall is erected, it's a crumpled ruin. In the meantime, the wall has suffered enormous punishment. Drastic changes in temperature, and damage by fire, simulated wind, and rain reveal sources of weakness. As the *coup de grace*, a machine capable of applying ten million pounds of pressure crushes the short-lived wall. The engineers record the sources of

Many different kinds of building materials are subjected to severe weathering to see which can stand the gaff.



Nine different kinds of chimneys shown in this picture are run through severe tests.

The weather resistance of various types of porcelain enamels is tested through exposure of specimen panels at various points throughout the United States.



strength and weakness, and better walls and materials result.

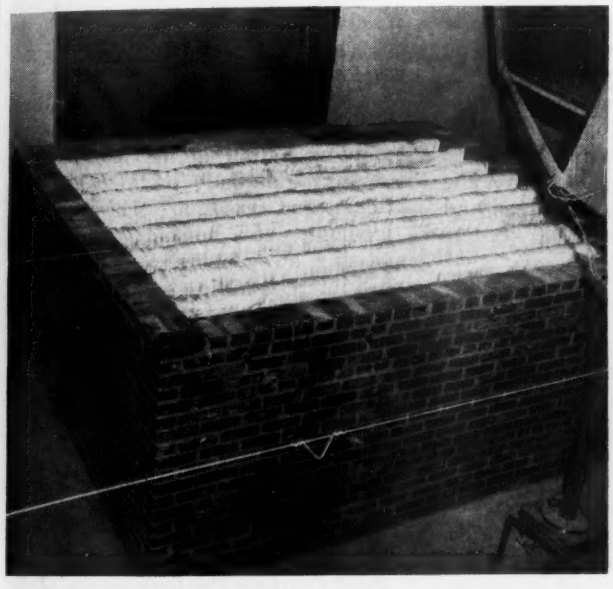
The Bureau has conducted many spectacular tests, but perhaps the most spectacular it ever ran occurred some years back in the downtown section of Washington, D. C. Two buildings, one five stories tall, the other two stories high, were slated to be demolished. The chance was too good for the Bureau's engineers to miss. The doomed buildings were filled with material similar to that to be found in any office and were set afire. Careful readings were taken of the temperatures reached in various parts of the building, and the resistance of various materials to burning were carefully noted. Comparing this first-hand information with laboratory data, the engineers obtained much valuable information from the burnout.

The range of materials the Bureau of Standards runs through its exacting tests is enormous. Electronic equipment, insulation, corn by-products, fire retardant coatings, plastic plumbing, (which is kept in constant operation for hours at a time), varnishes, soaps, adhesives, optical equipment—on these and hundreds of other items the Bureau of Standards maintains files.

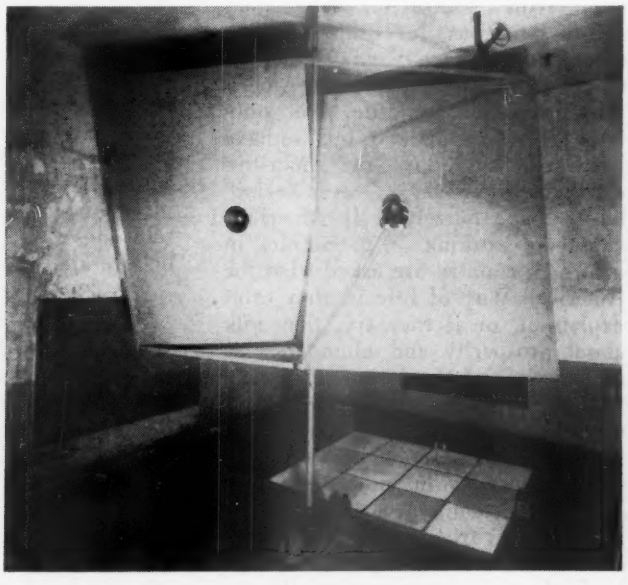
The incidental effect of this upon engineers (in their capacities as taxpayers) is a considerable saving of money. Take such a simple thing as paint, for example.

Uncle Sam is the world's largest user of office space and it costs him nearly three-quarters of a billion dollars a year just for paint and for painters to apply it. The Bureau's knowledge of paints, acquired after more than 50 years' experience, enables it to write specifications calling for paint of the highest quality which the government, as a big buyer, is able to get at a relatively low cost.

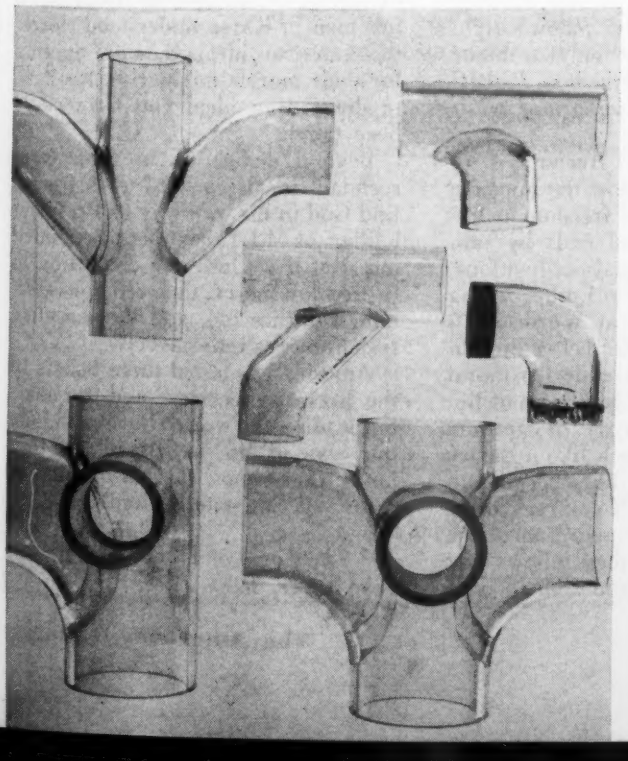
This is true of many of the things the government buys —fortunately for taxpayers.—***End.***

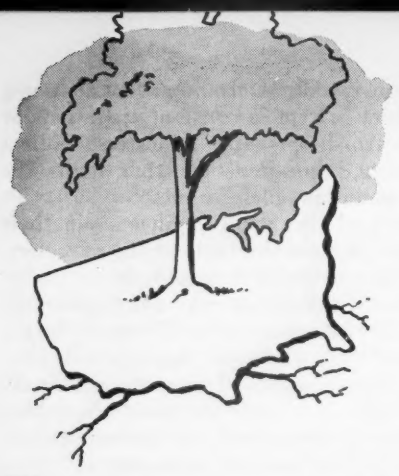


Above: One way to obtain very high sound absorbtion at low frequencies is by means of very thick acoustic structures. Here is shown an arrangement in the reverberation chamber of the Bureau for measurements. It consists of a two-inch thick fiber glass blanket folded into pleats about four-feet deep. Below: Plumbing materials made of plastics are tested by the Bureau.



Above: View of the 15,000 cubic foot reverberation chamber used for measurement of sound absorbtion coefficience at the Bureau of Standards. The fusion of sound is accomplished by means of the vanes which rotate at about 5 RPM. Below: The "wet hiding power," or covering ability, of paint is tested over a black and white checkerboard glass surface.





AMERICA'S ROOTS

By GILBERT E. DOAN

Research Department, Koppers Company, Inc.

WHY don't American engineers find strong friends of the American Way of Life when they go to India, South America and Western Europe on engineering contracts? Why does Nehru doubt us, for example? The answer is clear: No one has taken the trouble to express clearly the American Philosophy of Life. Not only hasn't it been expressed, but we have been so busy living "the American dream," that we haven't even formulated it for ourselves. If American engineers working on a contract in a foreign country are asked what the American Way of Life is, they can't explain it, or if they try, they talk about prosperity and abundance as an outcome of the incentive system. Or they talk about the freedom of everyone to believe and say what he wishes (which sounds like a confusion of ideas leading nowhere)! Foreigners conclude we worship money. Actually, our true strength, which has enabled us to develop engineering leadership, lies deeper than the incentive system and deeper than personal liberty. Prosperity and freedom are the flower of roots much more fundamental. But the source of our strength can be clearly stated. Why hasn't it been stated? How can a great nation like ours have failed to crystallize its basic ideals and to express them in language which the entire world can understand and respect? Why have we remained inarticulate in a troubled world or expressed ourselves fuzzily when challenged?

The case can be clearly stated: A free society such as ours is not an open society. It is one *dedicated to certain beliefs*: justice, mercy, truth, reason. It is not a place where everyone can do as he pleases. It is a society strictly dedicated to a distinctive set of ideals. For if all of are free to accept or reject what we please, then a dictator rising among us can reject justice openly and freedom vanishes. Freedom therefore is a *by-product* of our belief in justice for every man, be he rich or poor.

Neither is it the incentive system, the profit motive which has built us up, contrary to the claims of economists. Incentive has lived in the hearts of men for thousands of years of slavery with no effect. Hope of reward for a job well done springs eternal in the hearts of men, even through years of oppression. But it is the devotion to *justice* in America which actually gives to each man what he has earned. This is the ideal that stimulates hope and ambition and then unleashes a productive power like dynamite in the hearts and hands of men. It is economic fair play which has built this nation into the top potential of the world in 150 years. Economic justice has built our country, not the incentive system or simple greed and selfishness, as the industrial leaders believe and write so often.

WELL, what about freedom? Isn't that a basic principle of American Life? Freedom is an ambiguous word for there are different ways of being free. One is to be free from external constraint. This self-assertive conception of freedom can, unfortunately, be used to justify all sorts of objectionable behaviour. At some time or other it has been invoked in protection of the worst forms of exploitation, including even the keeping of slaves. It has served for the exaltation of the unique, lawless individual and of nations striving for greatness at any price. Thus freedom of the individual to do as he pleases, so long as he respects the other fellow's right to do likewise, plays only a minor part in the theory of freedom. *Private individualism is no important pillar of public liberty.*

Another concept of freedom is, in its extreme form, almost the opposite of the first. It regards freedom as liberation from personal ends by submission to impersonal obligations. Its prototype is Martin Luther facing the hostile assembly at Worms with the words, "Here I stand. I cannot do otherwise." Such surrender to moral compulsion is certainly a form of liberation. But this theory of freedom can become very much like a theory of totalitarianism. It does become altogether totalitarian if you regard the state as the supreme guardian of the public good; for it then follows that the individual is made free by surrendering completely to the state, as Professor Polanyi has pointed out.*

So freedom and liberty are not the bases of our way of life. What are they? A nation whose citizens are sensitive to the claims of conscience and are not afraid to follow them, is a free nation. That is to say, a nation of men and women dedicated to transcendant obligations to respect truth, to desire justice, to show mercy and toleration and to be amendable to reason is a free nation. *No other nation can be free.*

These seem like platitudes until we realize that the most vigorously expanding nation in the world today denies them flatly and teaches that justice and reason are the out-of-date ideologies of a bourgeois age that is passing away, mere screens for selfish interests hiding behind them, and indeed, sources of confusion and weakness to anyone who would trust them; that the only real forces in life are economic interest, power and subconscious desire. Thus is the Russian way of life completely opposed to ours.

AMERICAN engineers ought to be able to explain the foundations of the American Way of Life. We ought to understand our heritage so that we can defend it. We ought to realize that the cold war will be won ultimately in the hearts and minds of men, not on the battlefield, although the battlefield is necessary too. If our fighting men in Korea understood clearly the American ideals they are fighting for their morale might rise. It's hard to die for an ideal you have never been taught!

Beyond dedication to these transcendant ideals each of us is free to find God in his own way as President Killian of M.I.T. has recently pointed out. But if we lose our dedication to justice and mercy, then religious freedom vanishes too, and the incentive system passes into slavery.

America has tested these beliefs in the fires of experience and has come out leading the world. But it will help our way of life to spread to other lands, if we know the reason for our faith and can state it simply.

* *The Logic of Liberty*, U. of Chicago Press, 1951.

Strictly Business

Dravo Corporation and Subsidiaries, Pittsburgh, engineers and builders, had a net income for 1952 of $3,106,314, it was reported in the Company's annual report to stockholders. This compares with a net income for 1951 of $3,720,560.

Approximately 257,000 tons of tin—valued at $495,000,000—have been saved since 1941 through the coordination of industry and government research in tinplate conservation programs in the production of cans, it was revealed by Dr. Berton S. Clark, scientific director of American Can Company.

Contract for design of a vehicular tunnel to be built under the Intracoastal Canal west of New Orleans at an estimated cost of $5,500,000 has been awarded to Palmer & Baker, Inc., of Mobile, consulting engineers and naval architects.

This announcement was made recently in Baton Rouge by George Covert, director of the State of Louisiana Department of Highways, and by John J. Holtgreve, president of the Jefferson Parish, La., police jury, in which parish the Harvey Tunnel is to be constructed.

George Koch Sons, Inc., of Evansville, Ind., has been awarded a subcontract for sheet metal construction work on the Atomic Energy Commission's new gaseous diffusion plant being built near Portsmouth, Ohio.

The subcontract, estimated at $30,000,000, was awarded by Peter Kiewit Sons Company on a cost-plus-fixed-fee basis. Kiewit is the general construction contractor for the project.

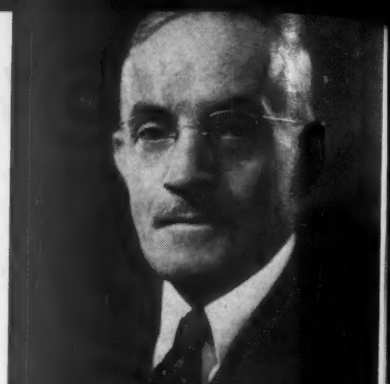
Additional facilities in Europe for the manufacture of aviation gasoline are needed to supply prospective European and Eastern Hemisphere demands over the next decade, Deputy Petroleum Administrator J. Ed Warren said recently.

The Petroleum Administration for Defense estimates, Mr. Warren said, that total demand for aviation gasoline in the Eastern Hemisphere, including civilian and military consumption, will continue upward through 1957 before leveling off over the next five years, as jet-powered aircraft in increasing numbers replace piston-engine planes.

Production of copper by mines, and primary smelters in the United States in January 1953, was virtually unchanged from the rate in December 1952, according to the Bureau of Mines, United States Department of the Interior. Refinery output from domestic ores was below the December level but higher than the 1952 monthly average. Production of refined copper from scrap at primary plants was close to the December total, both December and January showing a marked increase over the average monthly rates for 1952 and 1951. Apparent consumption of new copper dropped substantially below the high rate for December but was about 6 per cent greater than the monthly average for 1952.

NSPE Member Is World Famed Oil Expert

MISTER PETROLEUM



Dr. Egloff

WHEN Dr. Gustav Egloff, distinguished member of the Illinois Society of Professional Engineers and NSPE, accepted the 1953 Washington Award last February for his leadership in petroleum research and development, he remarked that, "Our civilization would come to a standstill without oil." To that can wholeheartedly be added the comment that our civilization's rapid progress in the development of oil resources and oil products could easily come to a standstill without Dr. Egloff.

An encyclopedic mind, tireless research, and devotion to the betterment of humanity through progress in his field of specialization have brought this energetic chemical engineer world recognition. He has been called to present his expert viewpoint at conferences in such far-flung places as Rome, London, Paris, The Hague, Tokyo, and Caracas. Special honors have come to him from around the globe—from the *Institute Technico Industrial* in Rio de Janeiro, for instance, and from the Chemical, Metallurgical and Mining Society in Johannesburg, South Africa. To his official title, Director of Research for the Universal Oil Products Company, Des Plaines, Illinois, which position he has held since 1917, could well be added the unofficial designation of "Mister Petroleum."

The most frequently repeated anecdote illustrative of the vast store of knowledge that Dr. Egloff has at instantaneous command is the story of the testimony he gave some years ago in St. Louis in a patent suit brought against Standard Oil of Indiana by Universal Oil Products over an alleged infringement of patent rights. Asked by an opposition attorney, "What do you know about emulsions?" he came up with the detailed answer that eventually prompted an editorial in the *St. Louis Post-Dispatch* stating that: "We are lost in admiration of Doctor Egloff . . . In the dim, dead days of last November, he took the witness stand in a suit of his company against the Standard Oil Co. . . . The workaday world has saluted the Armistice Day colors, waxed fat on Thanksgiving turkey, dressed a Christmas tree, observed the New Year's saturnalia and paid court to its lady love on the day of St. Valentine—and Doctor Egloff is still testifying. . . ." The editorial appeared on February 16th, noting that the extensive testimony was profound and pertinent.

Born in New York City of Swiss parentage, the future oil expert began his engineering studies at Cornell where he obtained his bachelor's degree in 1912. His Masters and Ph.D. were earned at Columbia University; and, before joining Universal Oil Products, he worked briefly for the U. S. Bureau of Mines and the Aetna Chemical Company.

Far from being the stereotyped, aloof scientist as so many experts are depicted even in their student days, Gustaf Egloff has always been an "all-around" type. While in school he went in for bicycle racing and won short races in the old Madison Square Garden and a 100-mile event on the road. Though relatively short and light in weight, he also won an intercollegiate wrestling championship at Cornell and was known as an outstanding golfer and swimmer.

Essentially an "idea man" on the job, he explains that basically he is working to draw practical developments useful for peace and also for times of emergency out of the vast reservoir of fundamental research. His own research has resulted in the discovery and patenting of more than 300 new processes for oil, coal, shale oil, and chemical derivatives of hydrocarbons. He is a prolific author of both books and articles in the same field and has served as technical adviser to the Government on any number of complicated questions.

WHILE his former Cornell classmate, Adolph Menjou, is being named to "best-dressed" lists, Dr. Egloff has been earning a sartorial distinction of his own as "the man dressed in oil," pioneering wonder fabrics, like Orlon and Dacron, which are revolutionizing the clothing industry.

When not travelling to the far corners of the United States—or the world—Dr. Egloff lives quietly in Chicago with his wife, the former Clara Mellor. But his predictions for the future of the petroleum industry, which now employs over 17,000 college-trained engineers and scientists in its vast programs, are far from quiet. He foresees gasoline that will give 50 miles to the gallon, even more fantastic improvements in high octane aviation fuels, newer and better plastics with a wider range of usefulness, vinyl floor coverings which will outlast the houses in which they are laid, and many more fabulous new synthetic textiles, some even looking like furs, developed through petrochemical research.

"Fantastic as the achievements of the petroleum industry in the past may seem, they are only an indication of what is yet to come," he says. "The industry has the kind of faith in the future that has made America great and continues to hold even greater promise for our civilization." A large portion of that faith has undoubtedly been contributed by Gustav Egloff himself.—*End.*

The development of fuels specially suited to modern military needs is one of the big jobs for petroleum research men like Dr. Egloff.

SUPPORT OF ENGINEERING EDUCATION

By E. W. SEEGER, P.E.,
Vice President, NSPE, of Milwaukee, Wisconsin

Our universities are confronted with higher enrollment, increasing cost of operation, decreasing purchasing power of income from endowments, and the gradual drying up of one of their principal sources of support. Although the enrollment in our universities is low at the present time, there is every reason to believe that it will be very much higher than it ever has been within a comparatively few years. The bulge in enrollment is being felt now in the lower grades, and will gradually move on into the high schools and colleges. This is a continuing problem in that we had approximately four million births in 1952—an all-time record.

As means are found for insuring that more of our gifted young people have an opportunity to attend college, the enrollment will go still higher. There are a great many people who believe that our national security requires that these outstanding students be educated—at Federal expense if necessary.

All of this adds up to the need of an enlarged over-all college plant.

Both the private schools and the tax supported schools have serious problems in finding sufficient funds to hold their good teachers and to meet their other necessary expenses. As far as tax supported schools are concerned, we should do everything possible to insure that they receive sufficient appropriations to carry out their functions. The plight of the private schools, however, is a little more difficult. Many of them are dependent upon income from endowments and occasional gifts to meet their budgets. The rise in prices, however, has reduced the effective value of the income from endowments, and the number of individuals willing and able to make substantial gifts to educational institutions has been reduced by our system of taxation.

The schools have tried to help themselves in a number of ways—some have tried to raise tuition but it does not seem possible to raise tuition high enough to meet all of the requirements. Some institutions, where the laws and other conditions permit, have changed part of their endowments from bonds to common stocks in order to obtain a higher income. Other schools have tried to replace a few large gifts with a large number of small gifts appealing to their alumni and other groups for this purpose. The most likely source of income, however, to replace the gifts formerly obtained from wealthy individuals is from industry as pointed out by Ruml and Geiger.* Very few businesses are contributing the 5% allowed by our tax laws for educational and charitable purposes. They have pointed out that with present tax rates the actual cost of contributions to the individual company is comparatively small.

It has always been necessary to subsidize higher education, both for capital expenditures and for operating expenses. In the past this support has come primarily from state and local taxes, endowments, religious groups, and gifts from wealthy individuals. More recently, a substantial amount of the income of schools has come from Federal sources. The total spent by the government for higher education and research was approximately $850,000,000 in 1949-50. A large percentage of this amount was subsistence allowance under Public Law 346 (GI) so that probably not over $200,000,000 was received by the educational institutions.

The new national administration is expected to reverse the trend of increased federal expenditures, and our educators must look at this prospect with mixed emotions. If it is to be accomplished in the educational field, they certainly must find other sources of income. Engineers and manufacturing companies have a direct interest in this question. The Engineering Manpower Commission of Engineers' Joint Council, and many other agencies have publicized the engineering manpower shortage. The NSPE has recently published a survey on how to improve the utilization of engineering manpower. Henry J. Taylor, in his radio broadcasts, has done a great deal to publicize the need for additional engineers. Our whole economy depends upon an increase in engineering and related activities. As industry becomes more mechanized, the total number of people required to produce a given amount of goods decreases but the number of technical people required increases.

If we are to have these additional engineers, we must support the institutions which are training them. If we decide to support such a program, we should decide first who to help and then how to help. In general, it is better to support an institution which is well known to the giver. This would indicate the general support of a local school, one in a nearby locality, or one for which the complete information is easily obtainable.

There are many types of support which are acceptable. Probably the most acceptable of all would be an annual gift for general operating expenses. Single large gifts, or gifts at the time of a campaign for additional buildings, are always welcome, as are fellowships, scholarships, and development contracts in some cases. The use of teaching personnel during the summer months or for consulting purposes is sometimes encouraged.

Many comparatively small gifts by individuals and corporations will more than offset the losses which the schools have experienced and will allow them to go forward and do the job which they are so anxious to do.—***End.***

*National Plan Assn.—Pamphlet #73.

Two Poems

By D. B. Steinman, P.E.

I Built A Bridge

I built a bridge across the tide
To reach the distant shore,
And there I roamed through fairer glens
Than I had known before.

I built a bridge across the vale
To reach the sunny slope;
With singing heart I built the span—
A rainbow arch of hope.

I built a bridge across the gulf
To reach my fellowman;
I found in him a kindred spark—
He helped me build the span.

I built a bridge across the years
To reach tranquility:
I did not know how beautiful
The last of life could be.

I built a bridge across the dark
To reach the unknown shore,
And there I found supernal love
And peace forevermore.

●

A Dream, A Song, A Prayer

A bridge of strength and grace in mystic blend
Embodies spirit treasures that transcend
The steel and stone. The builder's dream is there,
Each curve a song, each soaring line a prayer.
A dream, a song, a prayer—these three combine
To make the bridge a beacon and a shrine.

So with our lives, O Builder of our Span
Help us to weave these strands into Thy plan
In threefold blend: a dream to point the goal;
A song to lift the heart; a prayer, the soul!
Grant us these gifts of love, or life is bare;
Give us a dream, a song, a thankful prayer!

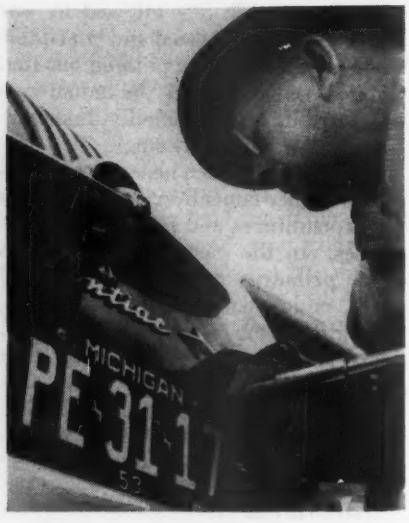
Charles F. Kettering, Noted General Motors Engineer, to Receive Third NSPE Award

Sunny Florida Scene of June NSPE Meeting

THE hundreds of engineers from across the nation who will attend the June 18-20 Annual Meeting of the NSPE at Daytona Beach, Florida, will witness events ranging from the granting of the NSPE Award to Engineer Charles F. Kettering, to the installation of Texan T. Carr Forrest, Jr., as the Society's 15th president, to a full morning's discussion on the "State of the Profession" by leaders in engineering.

The conference to be held at the Sheraton-Beach Hotel situated on one of the world's most beautiful beaches, offers professional engineers an opportunity to combine a delightful vacation with probably the most outstanding meeting of the year devoted entirely to the profession's over-all, non-technical problems.

Highlight of the meeting will be General Motor's Vice President Charles F. Kettering's acceptance of the NSPE Award for meritorious service to the engineering profession. The ceremony will take place at the gala Annual Banquet to climax the three-day affair. Mr. Kettering will be the third person to receive the Award, following Herbert Hoover and David B. Steinman.



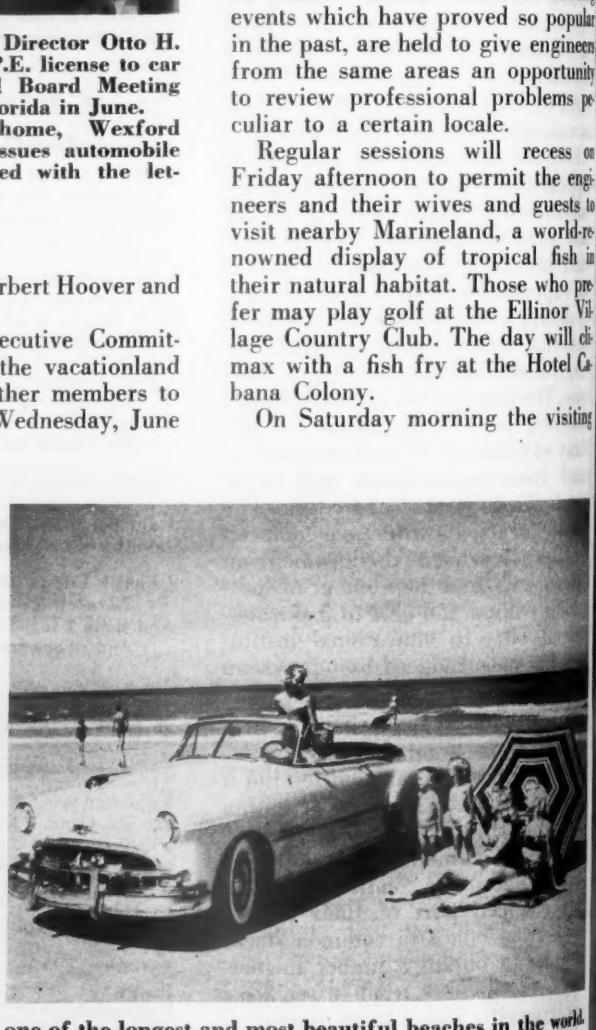
Michigan National Director Otto H. Hall, P.E., attaches P.E. license to car for trip to National Board Meeting at Daytona Beach, Florida in June. Director Hall's home, Wexford County, Michigan, issues automobile license plates prefixed with the letters P.E.

The Society's Executive Committee will journey to the vacationland one day ahead of other members to hold a meeting on Wednesday, June 17. Professional meetings with all Society members invited, will begin on Thursday morning. (*See list of agenda subjects, next page.*) At the noon luncheon the group will have as its guests members of the Florida Registration Board. Business sessions will be resumed in the afternoon and in the evening the day's events will be climaxed by a "Good Fellowship" hour.

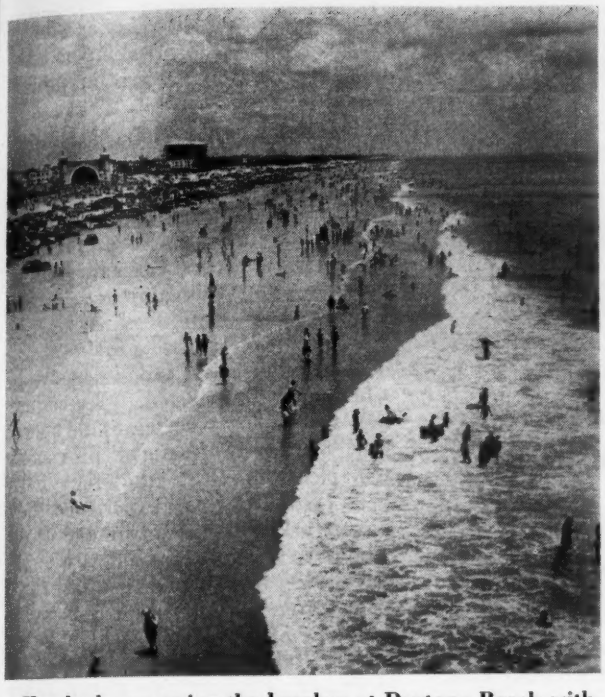
Professional discussions on Friday morning will be preceded by Regional Breakfasts. These eat-while-meeting events which have proved so popular in the past, are held to give engineers from the same areas an opportunity to review professional problems peculiar to a certain locale.

Regular sessions will recess on Friday afternoon to permit the engineers and their wives and guests to visit nearby Marineland, a world-renowned display of tropical fish in their natural habitat. Those who prefer may play golf at the Ellinor Village Country Club. The day will climax with a fish fry at the Hotel Cabana Colony.

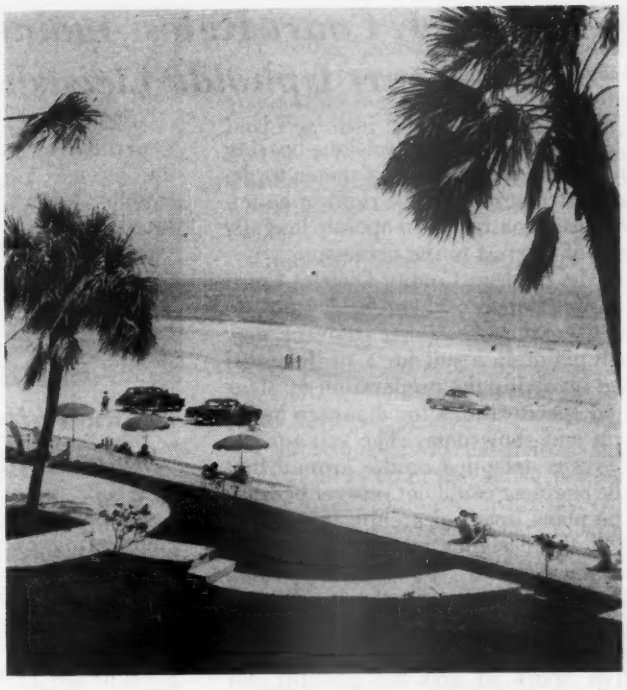
On Saturday morning the visiting



The above scenes show why Florida is becoming as popular as a summer vacationland as it is a winter resort. Daytona Beach, where the NSPE meeting will be held, boasts one of the longest and most beautiful beaches in the world. The area's beautiful trees and flowers are attractions for nature lovers.



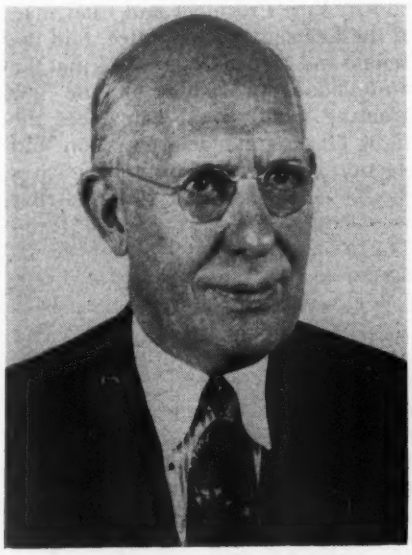
Hundreds can enjoy the beaches at Daytona Beach without getting in one another's way. Those who do not care for the water can enjoy the sun or find recreation on golf courses or tennis courts.



There are many possibilities for side-trips to nearby points of interest, one being Marineland. This unique display of tropical fish and plants will be visited by NSPE'ers as part of their program. Above: a quiet beach.

engineers will attend a "State of the Profession" program. This unique session will include a complete discussion and review of the major non-technical problems facing engineers today and steps being taken to solve them. This event will feature NSPE Past President Alex Van Praag, Jr., who will review "Professional Development." Another Past President of the Society, Perry Ford, will talk on "NSPE's Role in This Development," to be followed by Clark Ransom, General Electric engineer, who will discuss "Professional Development of Scientists and Engineers in Industry." The next speaker will be Karl B. McEachron, past chairman of the Massachusetts Registration Board who will tell the visitors about "Registration's Role in Professional Development."

The professional program for the morning will conclude with an open discussion on unity of the profession with particular emphasis on the NSPE's relationship with the newly enlarged Engineers' Joint Council. The Society has been invited to join the Council.



Charles F. Kettering, world famous General Motors Vice President and engineer, will receive the NSPE Award.

The regular Annual Meeting of the Society will be held Saturday afternoon, with all members joining the delegates in discussions. Outgoing President John D. Coleman of Dayton, O., will review his Administration's work. This meeting offers an opportunity for presentation by any attending member of subjects of professional interest.

The Annual Banquet Saturday evening will feature, in addition to the presentation of the NSPE Award to Mr. Kettering, the installation of new officers of the Society. This program will be followed by dancing, to signal the conclusion of the annual gathering.

Here Are Some of the Subjects To Be Acted Upon At Daytona Beach

Public Relations Program
Engineers' Week
Inter-Professional Relations
National Defense & Engineers
Young Engineer Activity
Engineers-In-Training Work
Work With Registration Boards
Chapter Activities
Awards
Rules of Ethical Conduct
Engineers' Creed
Registration Reciprocity
Telephone Listings
Enforcement Procedures
Engineering Education
Unity Discussions
Salary and Fee Schedules
Salary Surveys
Ethical Advertising
Utilization of Engineers
Conservation of Natural Resources
Employment Practices
Engineer in Government
Engineering-Management Research

N. J. Court Rules Against Engineer; Va. Court Upholds Licensing Principle

Two recent court decisions bearing upon the right of an engineer to design structures and the right of an unlicensed contractor to operate lawfully are of interest to the profession.

The Hudson County District Court (New Jersey) has held that a registered professional engineer may not maintain a suit for a professional fee involving the preparation of plans and specifications for a garage building and showroom. The suit for the fee was defended on the ground that the engineer could not recover because the plans involved architectural work and the designer was not registered as an architect. In a short opinion, the court said that the work performed by the professional engineer was primarily architectural work and that being so and the plaintiff not being an architect the case came squarely under the previous New Jersey case of *Gionti v. Crown Motor Freight Company*. The *Gionti* case, decided in 1942, involved a claim for survey work and architectural services which was denied because the individual was not a registered architect. The court rejected the argument that the *Gionti* case was distinguishable because the plaintiff had held himself out as an architect in that situation and because it was decided before a 1948 amendment to the law pertaining to the filing of plans and specifications which authorized filing by "licensed professional engineers" in addition to licensed architects.

Following his unfavorable ruling, the judge added, "However, I personally feel that the Legislature should straighten this matter out by proper legislation, but I must follow the reasoning advanced in the above case (*Gionti* case)—namely that it is beyond the power of the courts to change the present legislation." It is understood that an appeal will not be taken in the case but that consideration is now being given to seeking corrective action by the legislature in accordance with the court's suggestion.

The Virginia case, while not involving professional engineers, is pertinent because of the principle expressed upholding a licensing act. A contractor had sued for the balance due on work performed within the state but the paintiff company was not registered with the State Registration Board for Contractors. The Supreme Court of Appeals of Virginia said, in response to the claim that the failure of the company to register does not render its contract void and that it is entitled to the reasonable value of the services rendered and materials supplied, "The blunt answer to this final point is that a contract made in violation of a police statute enacted for the public protection is void and there can be no recovery thereon."

Engineers Testify On Taft-Hartley Before Senate and House Groups

Representatives of major national engineering organizations have presented their views and recommendations to the Senate and House Labor Committees in connection with hearings now underway to consider revisions to the Taft-Hartley Labor Law. On both occasions the several engineering groups testified on the same day, and thus the committees were able to compare the recommendations of the different organizations.

NSPE, represented by Clarence T. Shoch, Vice President and Chairman of the Legislative Committee, told the Senate and House Committees that the professional provisions of the law granting professional employees the right of separate determination and election in collective bargaining cases should be retained. He also urged that an amendment to the law be approved which would facilitate freedom of association among all professional personnel regardless of their supervisory or non-supervisory status. Under the present law an organization of professional persons including membership at all levels of employment may be deemed to be "company dominated" through the presence and activities of the supervisors if the organization as a non-collective bargaining group communicates with management on questions which touch upon working conditions, he said. Striking at this situation which causes stratification within the profession he said, " . . . associations of professional people should not be compelled to make the choice between functioning as a union on the one hand, or of taking no common interest or concern in professional matters. . . . "

The statement of a labor legislation panel of eight national engineering societies, including NSPE, presented by E. L. Chandler, reviewed the background of the present professional provisions and cited cases illustrating the successful application of these provisions. The committees were urged that the professional provisions be continued in any labor legislation which may be enacted. "We submit that any impartial review of the operation of the professional provisions will clearly indicate that they have been justified by past experience, they have worked to the advantage of all who have been affected and to the disadvantage of none and that they have truly promoted the basic concept of freedom of association which is inherent in the law," it was stated.

The Engineers and Scientists of America, representing engineering unions, also supported the retention of the present professional provisions, but took a completely different approach on other subjects. The ESA witness—Joseph Amann, president of the union group—stated that the definition of "supervisor" should be broadened so that more engineer employees could be eligible for union membership and that employers should be prohibited from dealing with other than legitimate unions on the subject of wages, hours and working conditions. He denounced the "sounding board" type of engineer organizations which discuss professional problems among the membership but do not engage in collective bargaining. Other recommendations of ESA were: government employees should be granted collective bargaining rights, the "free speech" provision of the law should be eliminated, the decertification provisions should be repealed, and the operation of state laws on union security arrangements and check-off should be prohibited.

The full NSPE statement favoring freedom of association for professional personnel is printed on page 42.

Next Month . . .

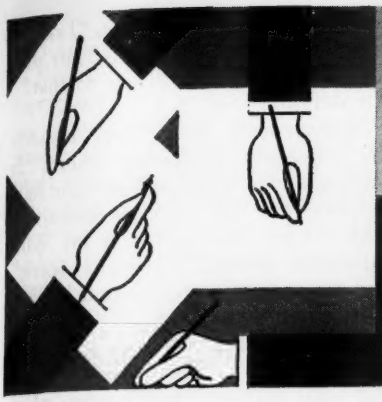
Read Senator Spessard L. Holland's up-to-the-minute report on the Pan American Highway.

Meet Harry A. Kuljian, the United States engineer helping to build India's T.V.A.

N. Y. Bill Calling For Corporate Practice of Engineering Is Withdrawn

The proposed Bennett-Carlino Bill, which would have permitted the corporate practice of professional engineering in the State of New York, has been withdrawn without having

(Continued on page 37)



Professional POSTSCRIPTS

Starting off this month's —PP— is a short item from an anonymous contributor. Ordinarily we like to know who our writers are, but in this case, we have waived this rule because of the interest of the subject. What do you think of the following?

—PP—

A processor of frozen food does not waste money on advertising the merits of canned foods—that is bad business and wasteful of the limited money set aside for advertising.

Why does the National Society waste the limited funds available for public relations work in encouraging high school students to enter engineering colleges. Let the industrial concerns do that, they . . . benefit.

Industry became big by hard-headed thinking. Let the National Society learn from this.

Let us use our funds in encouraging junior and seniors in engineering colleges to join the Professional Engineers; not high school students. The funds of the National Society are definitely limited and we can little afford to channel our efforts and finances on a project that does not definitely benefit the members of the Society.

I have approached several non-member Professional Engineers on joining the Society, but when they asked the above question, I could not give an answer . . .

—PP—

Before turning you over to our next author, John G. Kneiling, P.E., of Staten Island, N. Y., we would like to preface his piece with this information: According to legal advice, the New York registration law provision mentioned by Reader Kneiling provides that no corporation formed after 1951 may use the word "engineers" or "engineering" or a derivative of such terms in their name unless composed exclusively of professional engineers. Labor unions generally are not incorporated and the provision cited would therefore not be applicable. Such a provision does not appear in the majority of state registration laws.

—PP—

I have been reading the pieces in "Professional Postscripts" and I feel that there is one situation of national interest with which this column should deal.

Not long ago I attended a meeting of a neighboring county chapter of my state society at which the subject of engineer unions was discussed by a panel of spokesmen for some of them.

When my chance to question the speakers came, I quoted the law of this state—which I assume resembles the law of other states—which says that it is unlawful for any persons to constitute a voluntary organization whose name includes the word "Engineer" or derivative thereof unless all its members are duly licensed, all subject to the "grandfather" provisions. It is under these "grandfather" provisions that the "founder" societies do business. But the "engineer unions" do not seem even to have the right to existence under this law. I asked by what right they did exist, after quoting the law.

I was told by a spokesman for one of them that the "engineer unions" do business under Congressional authority, traceable to the interstate commerce provisions of the Constitution and that, therefore, they could ignore State laws.

I subsequently discussed this matter, as well as other illegal usurpations of the title "Engineer" with my colleagues in my own and neighboring counties and in nearby New Jersey. The conclusion appears to be that: 1) Most engineers do not know that they are protected by law in the use of their professional title, 2) the men I talked to, for the most part, agree that "engineer unions" can defy State laws with impunity, 3) if I insist on "throwing the law book" at persons illegally using the title "engineer," I will only "stir up trouble," make enemies of many people, bring ridicule upon the profession and otherwise do disservice to the profession, and 4) the State is not particularly interested anyway in enforcing the law until and unless the State Society provides the initiative. May I suggest, therefore, that the NSPE promote and continually press a program consisting of the following activities:

1 — Educate engineers generally concerning their rights in the several states to protection in the use of the title "engineer."

2—Encourage, repeatedly and continuously, the prosecution of "clean-up" programs aimed at eliminating the illegal use of the professional title. When the public sees a plumber's truck labeled "Joe Doakes Engineering Co." or "John Smith Engineering Co., Television repairs," then our profession cannot command much respect.

3—Closely police trade papers for violations. For example, an electrical contractor of my acquaintance received a circular from a washing machine distributor recommending that any washing machine servicemen whom he might employ be designated "Service Engineers." If such violators received a letter and then a summons, we would make progress, even at the temporary expense of "harmony."

4—Find, warn, and if necessary prosecute persons in corporate employ who use titles incorporating the word "engineer" in the absence of licenses. Such violations include "Sales Engi-

(EDITOR'S NOTE: *All those desiring to list their meetings under Dates to Remember should send* COMPLETE *information, including date and place, directly to the American Engineer.*)

Massachusetts Society of Professional Engineers — Annual Meeting, May 9. Hotel Kenmore, Boston, Massachusetts.

Pennsylvania Society of Professional Engineers—Annual Meeting, May 15, 16 Penn-Harris Hotel, Harrisburg, Pennsylvania.

Rhode Island Society of Professional Engineers — Annual Meeting, May 19. Rhode Island Yacht Club, Providence, Rhode Island.

Dominion Council of Professional Engineers—Annual Meeting, May 27-29. Edmonston, Alberta, Canada.

Nevada Society of Professional Engineers — Annual Meeting, June 1. Ranchinn, Elko, Nevada.

California Society of Professional Engineers—Annual Meeting, June 4, 5, 6. Hotel Californian, Fresno, California.

Georgia Society of Professional Engineers—Seventh Annual Summer Outing, June 15, 16. King and Prince Hotel, Saint Simons Island, Georgia.

National Society of Professional Engineers—Annual Meeting, June 18, 19, 20. Sheraton-Beach Hotel, Daytona Beach, Florida.

neers," many grades of "Chief Engineer," etc., whose names appear on sationery and elsewhere with improper titles.

I have little hope for local initiative in this matter without a lot of encouragement from the NSPE. But the only way we can gain the respect that other professions have attained is by adopting a positive attitude in this matter. And I fear we will gain little by persuasion. We should start with persuasion in each case, but should be prepared to see the law enforced with the same vigor that our colleagues on other professions would employ.

—PP—

We continue to receive more and more —PP— items dealing with the salary subject, but as long as they come to us in such numbers we will continue to print all we have room for. Here is Louis J. Rubenstein, P.E., of Brooklyn, N. Y., and he's calling for "a show of hands."

—PP—

Mr. Crepea's "Postscript" on Engineers' salaries was certainly appropriate for your March issue, for he came in like a lion and went out like a lamb.

I have known Mr. Crepea as a capable member of our profession for more than 25 years, but in this instance I must take issue with him.

He starts off with the oft-repeated lament for the low salaries and had the temerity to mention the words "labor union." He then backed off so quickly that he fell all over himself.

Why is he not honest enough to say that engineers are suffering not so much from "professional complacency" as from being guilt of self imposition of "professional incapability" to better themselves?

He "abhors" the thought of joining a labor union and then bemoans the fact that he is receiving less in wages than the union mechanic he supervises. The profession being what it is—an 80 per cent *employee* profession—what is wrong with joining up with the "blue collar" classes?

We have seen many professionals making great strides in the last 20 years by forming independent or nationally-affiliated unions in order to advance themselves. Witness the fact that teachers, actors, musicians, newspaper reporters, opera singers and many others who are truly professional are now members of labor unions without loss of prestige and with great gains as to salaries, working conditions, pensions, etc.

Low pay does not conduce to professional dignity or community respect. Neither does it conduce to bettering oneself professionally, for with the inadequate dollar one cannot afford to travel, buy technical books or publications—yes, or even join a professional society with its dues and attendant costs if one wants to be *really active* therein.

Mr. Crepea, unloads himself of a "sob" story of 35 years of frustration, and then says we ought to do this, and we ought to do that. *Ought to's can't buy autos!* There is only one approach to the solution of the problem and that is to have all *employed* engineers join up with an organization which has the *legal right* for collective bargaining as established by the Wagner Labor Relations Act of 1935. Many have already joined unions (in opposition to the mandates of Founder Societies), and many of these are members of my Chapter. They have made some headway, as Mr. Crepea admits.

Let's be honest about the subject of salaries. Can one truthfully say to a young high school graduate, "Take up engineering. It pays well. Your professional societies will see to that?" No, definitely no!

Management these days respects the bona-fide, temperate union. It recognizes the right of collective bargaining, but the societies instead of such a right must fall back on "educating the public," "fraternal spirit" and "moral suasion." Sounds kind of silly, doesn't it?

Right now there is a large demand for engineers. May it last forever. But what may very well happen when there is a let-down? Back to the low-paid, "dog-eat-dog" status? We must legislate toward better salaries and working conditions *now* and see that they remain adequate and commensurate with the other professions.

No, Mr. Crepea. Rather than "abhorring" the Union, you should be in favor of it as the ultimate answer to your lament. The Union will fight for better standards with the endorsement of the societies. This support will encourage membership in the societies, so that, with the resultant increase of membership and prestige, they can lend their weight in obtaining the goals aimed at.

Who is right—Mr. Crepea or I? Let's get a show of hands . . .

—PP—

The Fairless story on labor-management relations in the March issue, drew more response from our readers than any one article in some time. Here is one good observation by P. A. Seward, P.E., of Lynn, Mass.

—PP—

In your March issue Mr. Fairless wonders why we have a senseless warfare between management and labor. A contrast is made between the success of management in scientific and

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engineering endeavor and its record in the field of human relations. The former concerns itself with the natural law, the latter with the moral law. Science discovers the truths of the natural law. Engineers exploit these principles. Philosophers have discovered the truths of the moral law. Union leaders have profited from them.

The truths of both the economic and the moral law are the principles upon which our system of collective bargaining depends. This system is democratic. It fits into the American way of life. We must not be dismayed because the system has been misused. Let us have the patience and determination to remedy the abuses. Let us not abolish the system. There is bound to be some even serious conflict. Both parties to the system, management and labor, have been organized to attain different ends. Industrial peace will come when both take a charitable view of each other's aims.

The aim of management is to operate at a profit. This is accomplished: first, by supplying the wants of the public with a quality product at reasonable cost on schedule; secondly, by maintaining good employee relations. Unions were organized to give the worker a voice in that which affects his well-being. This is done: first, by demanding a comparatively high wage; and, secondly, by fighting paternalism. Few enterprises are destroyed by high wages. Paternalism can kill a labor union. The worker will take paternalism, the union leader, never. Many industrial leaders are ignorant of this fact. Such invite trouble.

Leadership is the bone of contention between management and labor. It is galling to the industrialist to realize that in the past generation he has lost his leadership in government and labor circles. On the other hand, the union boss has become a leader in the eyes of the politician and the worker. More citizens will follow the leadership of a union boss than will follow the leadership of a representative of management. As a result, some industrialists have become chagrined; some union bosses have become drunk with power.

How did this come about? How may the tide be turned? Management has been successful in satisfying the material wants of the public. In doing so it has lost its position of leadership to the labor bosses. The union leaders have come out on top by the simple expedient of making the worker feel important. They give him a "voice," or at least pretend to do so. Management, in its successful economic endeavors, has been out-maneuvered by the unions in the higher field of human relations.

How may the tide be turned? It is only human for those with power to be tempted to abuse it. Some union leaders have done so. Management should refer to the moral law, a code under which they have equal rights with labor. Enterprise has a right to a profit, a right to protect its property, a right to supply the needs of the public in accord with economic law. Management has no right, or duty, or obligation, to bargain with those who would not hesitate to destroy the enterprise entrusted to their guidance. The moral rights of the public and the stockholders exceed the economic rights of labor.

Management has much to be thanked for. It has given the worker good pay, job security, excellent working conditions, numerous fringe benefits, a happier home, better food for his children, smart clothes for his wife, prosperity for his community. The industrial age has actually freed man from the necessity of slaving from dawn to dusk to satisfy his simplest material needs. If the question is properly put, no union leader can vote against these benefits. But, man does not live by bread alone. The sense of importance, the "voice," unions have given to the worker must be appreciated.

Management can get back in the driver's seat by giving the worker a sense of belonging, by showing the utmost respect for his dignity, by appreciating him in immaterial, humane, spiritual ways. It can go the union one better, and regain its position of leadership, by making the wives and children of the worker feel important. Industrial leaders might well do this instead of wasting so much time and effort in selling themselves to one another and impressing each other with their importance. The union boss gets his power by making someone else, not himself, important.

Industrial peace may be achieved by collective bargaining if both labor and management take a charitable viewpoint of each other's aims. Management has the character and ability to accomplish this. It can recognize the power which organized labor has given to the "voice" of its workers. It can force unions to take a charitable view of its economic aims. It must educate the families of the workers, and the public, in the benefits to be derived from obeying the economic law. It must make the wife and children of the worker, and the public as a whole, feel important. In exchange for a "voice" management can get what it wants from the public—leadership.—***End.***

NEW LITERATURE

To help the offering firms determine which literature you require, when requesting an item, be sure to list all specifications shown . . . and say you saw it in the AMERICAN ENGINEER.

MATERIALS HANDLING — Full details of fork lift truck models are available from Revolvator Co. Telescopic straddle type lift truck, for crowded areas, narrow aisles, shown in "Fingertip Control" ad on page 3.

—AE—

COPY PRINTING — Peck & Harvey, manufacturers of whiteprint, blueprint, and photocopy equipment offer a "Spee-Dee" brochure on their products which cut reproduction costs and time for exact duplicates of drawings, etc. See Peck & Harvey ad on page 5.

—AE—

MOTOR STARTERS — The Arrow-Hart & Hegeman Electric Co., 103 Hawthorne St., Hartford 6, Conn., announces a folder for engineers describing advantages of the new Type "RA-V" Magnetic Motor Starters. For use especially in the new Crouse-Hinds M52 Type EPC Explosion-Proof Condulets, preferred in petroleum, chemical, petro-chemical and related industries, where combination of explosive atmosphere plus adverse climatic conditions is critical.

—AE—

CORROSION INHIBITORS — Two bulletins on protecting metals from rust and corrosion without using oil or grease, offered by Industrial Packaging Div., Berlin and Jones Co., Inc., 601 West 26th St., New York 1, N. Y. 1) Technical Bulletin VT-1, a general primer, covers definitions; applications; toxicity; galvanic action; reactions; moisture and condensation; shelf life and package life; other basic data. 2) General Bulletin GB-1 deals specifically with "DryVapor Pack-velopes, a positive protection for Steel and Aluminum." Cost saving and time saving advantages.

—AE—

STEEL TUBING — Nikoh Tube Co., 5000 S. Whipple St., Chicago 32, Ill., tells story of electric weld steel tubing in an attractive 32 page brochure available on request. Data and reference material includes useful conversion tables and illustrations of uses, plus other basic information.

—AE—

TUBE FITTINGS—Ermeto tube fittings which require No Flaring, No Threading, No Welding, No Soldering are treated in Ermeto Catalog No. E-1457 available on request from The Weatherhead Co., 300 East 131st St., Cleveland 8, Ohio. Manufacturer states fittings provide a more positive seal than flared or compression type fittings.

—AE—

CONCRETE CURING — Hunt Process Concrete Curing is detailed in an illustrated brochure available from Hunt Process Co., Inc., 7012 Stanford Ave., Los Angeles 1, Calif. Tells where, how, quantity to use; type of equipment. Explains pigmented compounds.

—AE—

STRUCTURAL STEEL — Penmetal Light-steel structural sections are described in 12-page catalog No. SS-1, just printed. Covers low cost steel frameworks for smaller buildings—residences, stores, schools, factories and warehouses. Included are tables of physical and structural properties, loading tables and full specifications. Write: Penn Metal Company, Inc., 205 East 42nd Street, New York 17, N. Y.

N.S.P.E. Believes

IS OUR REGISTRATION REQUIREMENT LIMITING MEMBERSHIP?

BY PAUL H. ROBBINS, P.E.

Executive Director

N.S.P.E.

IT is a rare chapter or state society which cannot point to some outstanding engineer in its area who is not registered and whom the chapter would be proud indeed to have as a member. Consideration of this problem comes up frequently in membership discussions and gives rise to a review of some of the basic reasoning behind the requirement of registration for membership in NSPE.

Perhaps we should first review the philosophy on which registration is based. It will be recalled that, when the Federal Constitution was adopted, the police power to protect its citizens was retained by the states. As we have become more mechanized and living has become more complicated, more and more training is being required of those charged with various phases of engineering work. Too, as the engineering profession has attained greater professional stature, there are those who have some service or product to which they wish to give more prestige who have tried to associate the service or the product with engineering. To protect the public from such false representation, it is only natural that registration laws would emerge.

Most engineers have, at one time or another, tried to evaluate just what it is that distinguishes a profession from other types of work. Almost without exception they arrive at the conclusion that public service is one of the basic hallmarks of a profession. It is logical, therefore, that the engineering profession would encourage engineering registration in order that the highest degree of public service may be attained.

These, then, are the basic reasons behind registration: (1) the protection of the public; and (2) (and incidentally) an improvement in the quality of engineering.

Unfortunately, there are a number of contributory reasons why all engineers do not immediately become registered. One of the principal among these has been a failure on the part of the engineering profession to sell the values of registration, and a correlated failure on the part of the users of engineering services to appreciate both the impartial additional review of qualifications after a period of experience and the legal status this gives members of the profession.

The picture, however, is changing rapidly. It will be recalled that it was in 1907 that the Wyoming Legislature passed the first engineering registration law. Since that time, every State and Territory of the United States has passed legislation governing the practice of professional engineering. Since 1907, the ranks of registered engineers have increased until today there are more than 175,000 registrants on the lists of the 48 states and 4 territories.

One of the cornerstones on which NSPE has built is a belief that the Society should be governed and controlled by engineers and engineers only. We have believed that the professional society should not have grades of membership, but that once an individual has clearly indicated his competency in the profession he should be on a par with every other individual who has met similar requirements.

Thus the only problem facing the founders of NSPE and its continuing Administrations has been that of defining what constitutes a qualified engineer. Looking for a suitable definition, they were struck immediately with that established by law in the Registration Acts. Recognizing further that here were legally organized Boards of eminent members of our profession, competent to pass on whether or not individuals of the profession met these qualifications, the founders felt that it was unnecessary to establish, within the Society, another criterion for defining an engineer and another board of review. Instead, they said, we will accept the review of the Board of Registration wherever it may be legally constituted. Noting the success of registration in defining the professions of medicine and law, and believing that in the long-run all qualified engineers would seek the legal status afforded by registration, they thus established registration as the criterion for membership.

The trends of the last few years have indicated the increased acceptance of registration. Accepting the estimate of 400,000 members of the engineering profession, recognizing that most state laws require four years of responsible engineering experience (few engineers attain this experience in less than five years), and realizing that 150,000 graduates thus are not eligible for registration, we can see that the 175,000 registered engineers represent nearly seven out of ten of the eligible engineers.

Thus, it is argued, registration offers no bar to the increase in size and influence of NSPE. It only remains for all registered engineers to become aware that public recognition does not result without the expenditure of time and money and that, if we are to have professional status, we must expend our efforts in the development of our professional activities. Support of the majority of the registered professional engineers in the country for NSPE and its programs would do much toward improving the profession's status.—*End.*

With Our Members . . .

Regional Meeting

Alabama SPE Plays Host in Birmingham To Delegates from Southeastern Area

The first regional NSPE meeting for the Southeastern area was held recently at the Dinkler-Tutwiler Hotel in Birmingham, Alabama, with members of the Alabama SPE playing hosts to the visiting delegates. The conference was held in conjunction with the National Convention of the National Council of State Boards of Engineering Examiners, of which the president is A. G. Stanford who held the corresponding office with NSPE in 1949-50.

Principal speaker for the event was Lt. General Lewis A. Pick, ret., former Chief of the Army Corps of Engineers. Others who gave lectures at the various NSPE sessions were R. E. Strickland, Jr., Lt. Col. A. B. Schwarzkopf, Belton Y. Cooper, Wyllys G. Stanton, and N. W. Dougherty. A panel discussion on *Professionalism* was also moderated by Mr. Dougherty, who is Dean of Engineering at the University of Tennessee and an NSPE Vice President. Members of the panel included James R. Garber, M.D., H. Hobart Grooms, a lawyer, and R. G. Sturm, Ph.D., C.E.

Another highlight of the two-day meeting was a tour through a local steel mill of the Tennessee Coal & Iron Division, U. S. Steel Corporation.

A varied social program and a special schedule for the ladies in attendance were also provided.

H. K. Weaver is president of the Alabama Society.

Income Survey of Professional Engineers

An exhaustive salary survey is being completed by NSPE. The survey covers 29,000 registered professional engineers, in all branches of engineering, throughout the United States. It contains information on latest income, branch of engineering, number of years in profession, type of position, field of employment, geographical breakdown.

Watch for it in the June Issue, AMERICAN ENGINEER.

Birmingham Meeting Participants

The above group was photographed at the recent Southeast Regional Meeting. They are, l. to r., J. H. Sams, Dean of Engineers, Clemson College, and Vice Pres., So. District, NCSBEE; Lt. Gen. Lewis A. Pick, ret., the principal speaker; A. Stanford, NCSBEE Pres. and a past president of NSPE; and N. W. Dougherty, Dean of Engineers, U. of Tenn. and NSPE Vice President, Southeastern Area.

Firearms Program On San Jose Schedule

The highlight of a recently-reported meeting of the San Jose Chapter, California SPE, was a lecture on the development of small firearms from 1560 to 1870, delivered by Dr. Lydik S. Jacobsen, head of the Mechanical Engineering Department of Stanford University. The address was supplemented by the showing of color slides and the display of models of several types of such guns.

Legislative Program In Denver

At a recent meeting of the Professional Engineers of Colorado, State Representative Paul Hodges explained the operation of the State's legislature. The meeting was held at Cunningham's Restaurant in Denver, and was preceded by a dinner for the engineers and their guests.

Report From Tennessee

A. W. Stone, newly elected president of the Tennessee SPE, presided at the recent meeting of board members and chapter presidents, held in the Maxwell House in Nashville. Various business matters were discussed at the session, and committees were named for the year, with the chairmen as follows: *Education,* D. W. Mattson; *Young Engineers,* Charles M. Bull; *Membership,* Alan M. Razovsky; *Ethics,* Harry B. Hunter; *Fees and Salaries,* John C. Brough; *Registration,* Stuart Fonde; *Public Relations,* John D. Seay; *Engineer-Architect Joint Relations,* R. H. Hoshall; *Legislative,* W. F. Moehlman; *Organization and Administration,* N. S. Dougherty; and *Civil Defense,* R. Guy Hurley. In addition, a special committee was set up under the chairmanship of B. T. Sumner to study the question of establishing a permanent executive secretarial office and inaugurating a State magazine.

Sheridan Memorial Scholarship Established

Brother Bonaventure Thomas, president of Manhattan College, New York City, and Frederick H. Zurmuhlen, City Commissioner of Public Works and a trustee of the College, have recently announced the inauguration of the Arthur V. Sheridan Memorial Scholarship to help deserving engineering students. Dr. Sheridan, who met an accidental death in 1952, was a past president of NSPE and also of the New York State Society which he helped found.

The new scholarship fund, which will be administered by Brother Amandus Leo, Manhattan's Dean of Engineering, was established by an initial $10,000 gift from Dr. D. B. Steinman as a personal memorial tribute to his friend and colleague.

. . . more news on page 38

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N. Y. Bill

(*Continued from page* 30)

reached the floor of the Albany legislature for a vote.

The New York State Society of professional Engineers played a leading role in opposing the suggested legislation on the grounds that it would appreciably weaken current State engineering regulations.

NYSSPE President Edward J. Nunan appointed a special Legislative Committee to lead the Society's opposition to the Bennett-Carlino measure. The law firm of Coudert Brothers was selected by the Committee to represent the Society as Legislative Counsel, with partner Francis D. Wells in charge, while legislative associate Ernest Hochwald was in constant attendance at the Senate and Assembly Chambers in Albany. NYSSPE Executive Secretary Harold Beckjordan served as director and coordinator in working with President Nunan, the Legislative Committee, and the Coudert Brothers lawyers handling the matter.

In addition, members of the various chapters throughout the State wrote and telegraphed their Senators and Assemblymen pointing out the dangers to the public welfare that they felt were inherent in the proposed bill and explaining the scope of the engineering profession. Many others contacted their legislative representatives in person.

Ohio Jubilee Scenes

Pictured at the recent OSPE Diamond Jubilee Meeting are—Above, l. to r., Dr. Walter E. Lawson, du Pont Corp., a convention speaker; Philip Rea, Ohio State Highway Engineer; Perry T. Ford, a past president of both OSPE and NSPE; and John D. Coleman, NSPE President.

Below, l. to r., the three new vice presidents of the Ohio Society: C. R. Hanes, Columbus; Paul A. Harlamert, Cleveland, and Wallace T. Adams, Middletown.

Rhode Island P.E.'s Visit High Schools

In an effort to interest senior high school students in engineering as a career, four members of the Rhode Island Society recently spoke before student audiences in the Providence schools. Those taking part in the project included: Vincent DiMase, Providence Deputy Inspector of Buildings and NSPE National Director; Fenton Keyes, consulting engineer; Henry Ise, Chief of the Rhode Island Division of Harbors and Rivers; and Charles E. Blais, Head Maintenance Engineer, Quonset Naval Installation.

Illinois Society Honors V. E. Gunlock

Virgil E. Gunlock, Commissioner of Public Works for the city of Chicago, was presented with a high service award of the Illinois SPE at a recent meeting of the Chicago Chapter of the Society. Commissioner Gunlock was cited for "his outstanding service to the Illinois Society of Professional Engineers during his tenure as President during 1951."

John Dolio, president of the Chicago Chapter, presented the certificate which was signed by ISPE President A. Douglas Spicer and Secretary Harold E. Babbitt.

Delaware SPE Programs Reported

Two interesting dinner meetings have recently been reported by the Delaware SPE. The first, held at the Hob Tea Room in Wilmington, featured twin addresses by Alexander R. Abrahams, treasurer of the City of Wilmington, and John I. Cahalan, former county engineer of New Castle County. Their respective topics were *Wilmington City Government* and *New Castle County Government*, and an open forum discussion followed the presentation.

At the second meeting, held April 16 in the Gold Ballroom of the Hotel du Pont, NSPE President John D. Coleman was guest speaker. Members of the Tau Beta Pi Fraternity joined the Delaware Society P.E.'s for the event.

New President For East Bay, Calif., Chapter

A special meeting was held recently to elect a second new president for the East Bay Chapter of the California SPE. President-elect Ray Fuhrmann's decision to accept an offer from the Honolulu Iron Works necessitated the extra election at which Douglass R. Judd was chosen for the first office. Outgoing chapter president Harold Johnson presided.

P.E.'s At Work

Perna-Palazzo & Co., a new engineering and contracting firm, has just been organized in Trenton, N. J., by NSPE member Ralph D. Palazzo and Leonard P. Perna. . . . James J. Corbalis, a VSPE Vice President and State Director, has been appointed Engineer-Director of the Sanitation Authority of Alexandria, Va. . . . Henry Harkleroad, who has been Assistant Bridge Engineer in the Texas Highway Department, has been designated TSPE Executive Secretary, succeeding Wallace M. Driskell, Jr., who is going on active duty with the U.S. Air Force. . . . John L. Hodges, formerly of Philadelphia, has become the new Chief of the Cleveland, Ohio, Smoke Abatement Bureau. . . . Clyde H. Haynes is now manager of the Patent Department, Nelson Stud Welding Division, Gregory Industries, Inc., Lorain, O. . . . Formation of the consulting engineering firm of Eichwald Associates, with offices at 237 East 39th Street, New York, and New Haven, Connecticut, has been announced by Bernard Eichwald.

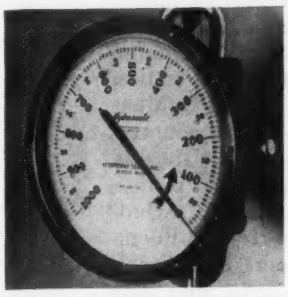
. . . more news on page 40

What's New

This column describes new products of general interest to professional engineers. For further information, fill in the coupon provided and mail to the AMERICAN ENGINEER.

NEW BATCHING SCALE — *Item 1*

"Hydroscale," a new batching scale by Hydroway Scales, Inc., has reverse reading dial. As container contents are poured off, pointer retreats, registering amount of decrease. No computation necessary. Used for batching of liquids and loose material in paint, chemical, food, drug, metal casting, etc. Available in 500 and 1,000 pound models with 12" dials.



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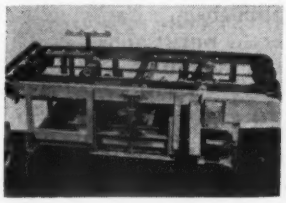

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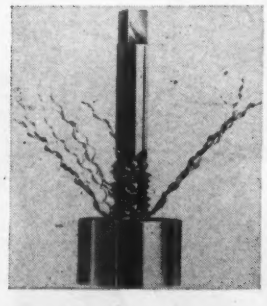

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D. C. Engineers Explore Plumbing Code Chances

The Public Relations Committee of the District of Columbia Society of Professional Engineers recently sponsored the first of a series of Professional Engineering Forum panel discussions on the subject of a National Plumbing Code. Vincent T. Manas, executive secretary of the Coordinating Committee for a National Plumbing Code, was moderator for the meeting. Other panel members were: Robert S. Wyly, associate chief, Hydraulic Laboratory, National Bureau of Standards; Malcolm Hope of the U. S. Public Health Service; William Scheick, director, Building Research Advisory Board, National Academy of Sciences; and Norbert Melnick, director of inspections, Arlington County, Va.

Engineer V. J. Richter is chairman of the D. C. Society's Public Relations Committee which organized the discussion as a public service feature of its program.

AE Subscriptions For Pasadena Libraries

Seven Pasadena area libraries are to receive a year's subscription to the AMERICAN ENGINEER as a result of action taken recently by the Executive Board of the Pasadena Chapter, California SPE. As part of the chapter's public relations program, the Board established a special library fund from which the subscriptions will be provided.

Institutions scheduled to receive the magazine include the Alhambra, Altadena, Arcadia, Pasadena, Sierra Madre, and South Pasadena Public Libraries and the Pasadena City College Library. Other subscription gifts will be made when additional funds are contributed to the program.

Nation-Wide TV Show Brings Many Compliments

The New York Chapter, NYSSPE, reports that compliments are still being received on the nation-wide half-hour television broadcast that it sponsored during Engineers' Week. The program, which originated in the Washington, D. C., studios of station WTTG, was carried on the DuMont TV Network throughout the country.

Chapter participants in the show, a panel discussion of the role of professional engineers in public life, included the President, Dean Herbert Roemmelle, Frank Billhimer, and Frank Cardwell. Special guests who also joined the discussion were Senator George W. Malone, P.E., of Nevada, and Dr. Thomas T. Goldsmith, Jr., Director of Research for the DuMont Laboratories.

The program was organized under the direction of Rodney D. Chipp, a New York chapter member and Director of Engineering for the DuMont Network.

New Arizona Officers

New officers of the Arizona Society of Professional Engineers, announced at the recent Annual Meeting, include: President, Davis Bartholomew; Vice President, J. E. Hastain; Secretary-Treasurer, John H. Stufflebean; National Director, Walter A. Burg; and Director at Large, C. B. Maguire.

Movie Is Shown In Knoxville

Soil Structure—Key to Productivity was the title of a movie shown at a recently-reported meeting of the Knoxville Chapter of the Tennessee Society. Carsten A. Arentson of the Monsanto Chemical Company introduced the film to the engineers and their guests.

With the Ladies

By MRS. WILLIAM J. FELL
Chairman, NSPE Ladies' Advisory Committee

Members of the Neuces Auxiliary, Texas SPE, have been pursuing a very active schedule this year. Outstanding events they have sponsored included an Engineers' Week Tea for wives of all P.E.'s in the Corpus Christi area and an old-fashioned box supper and cake auction.

The Grand Valley Auxiliary, Michigan SPE, held its first anniversary meeting recently at the home of Mrs. Scott Baker, the vice president. The organization's membership has increased from fifteen to forty during its first year.

Another group about to celebrate its first anniversary is the Pittsburgh, Pa., Chapter Auxiliary. Mrs. Glenn Moore Comstock is president of the auxiliary which has included supper dances, luncheon meetings, and theater benefits in its program schedule.

The WOES, Los Angeles Auxiliary members, have recently inaugurated a public speaking project as part of a self-improvement program.

Texas' Travis Chapter Honors Austin P.E.

At their annual Recognition Dinner, held at the Driskill Hotel in Austin, Texas, the members of the Travis Chapter of the Texas SPE honored Austin City Manager Walter E. Seaholm as the outstanding professional engineer of the year. The honoree, an electrical engineering graduate of the University of Texas, has been associated with the Austin city government since 1922, and he has also held TSPE offices.

MORE ENGINEERS' WEEK PICTURES. Shown below are two groups of participants in outstanding Engineers' Week ceremonies. At the left, Governor Edward F. Arn of Kansas (seated) presents the official proclamation to KSPE President Abram Pratt, while Engineers' Week Chairman L. S. Hobson (extreme left) and L. W. Newcomer, President of the Kansas Engineering Society, look on. On the right are officers and governors of the Professional Engineers of North Carolina: Seated, l. to r., are W. P. Wells, Treasurer; J. D. Coleman, NSPE President; G. S. Rawlins, President; and R. B. Cochran, Secretary. Back row, l. to r., are A. H. Barber, Jr., Vice President; T. C. Brown, Vice President; N. D. Pierson, Delegate, Central Carolina Chap.; B. O. Vannort, Delegate, South Piedmont Chap., W. F. Freeman, Past President; R. B. Rice, Governor; J. C. Bolen, Governor; M. F. Wooten, Jr., Delegate to NSPE. E. C. Hubbard, also a State Governor, is not pictured.

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Labor Legislaion testimony of NSPE presented by Clarence T. Shoch, Vice President, and Chairman, Legislative Committee, before Senate and House Labor Committees

. . . We fully and completely endorse the statement previously presented (Editor's Note: This refers to the statement of the labor legislation panel of national engineering societies urging retention of the present professional provisions of the Taft-Hartley Act.) favoring the retention of the present professional provisions of the Taft-Hartley Act and join in strongly urging that Section 2 (12) and 9 (b) (1) of the present law be retained in the present form.

In addition, we would like to call to the Committee's attention a problem of the engineering profession which is of particular importance to the welfare and continued technological and industrial growth of the country and one which many of our employee members, particularly those in industry, feel requires corrective action. Our interest relates to the professional engineers in industry including those younger engineers who are working under the supervision of professional personnel as a step toward their full professional status, or put another way, extends to those who are within the definition of professional employee in the engineering field as set forth in Section 2 (12) of the Taft-Hartley Act. We do not refer to subprofessional or technical personnel. The immediate problem grows out of a serious handicap imposed by the national labor law as it affects these professional employees, notwithstanding the existence of Section 9 (b) (1). To illustrate clearly the nature of this problem, we would like to give a brief outline of the relevant historical background.

The extensive development of industrial establishments brought with it a new pattern of employment for professional engineers. The scientific personnel in many companies has grown to a point where in a single company it may exceed the entire scientific population of the nation a few generations ago. This has resulted in the organization of self-contained associations of engineers with a community of interests, an abundance of talent, and at the same time common professional problems relating to the fact that the members of these groups have a single employer. While the members of these associations are, in one sense, all employees of the company for which they work, they are bound together by their common professional training and interests. We believe that it is fair to state that the great technological production achievements in this country have been due in no small measure to the close-knit character of the engineering profession because it has promoted the free interchange of ideas, opinions and data among all levels of its membership.

Wherever the existence of such employment has created large engineering staffs, these engineers have common interests pertaining to their responsibilities, opportunities, and their professional status. These common interests cut across lines which normally may be said to distinguish managerial and supervisory employees from others. In a very large sense the engineer is an "employee" whose special professional status closely identifies him with management as distinguished from rank-and-file employees. In fact a significant percentage of engineers actually are in training too, and will become the "managers" of tomorrow.

The common professional interests of the engineers associated with a particular company have led to the establishment of local engineering associations. These associations are customarily open to all professional people regardless of management status in the sense of direct supervision of people. This, of course, has also been the traditional pattern established for many years by our national professional societies. Most of the members of these local associations are also affiliated with the national engineering society of their particular specialty. The members range from recent college graduates to eminent scientists and engineering executives.

The intent and purpose of the formation of these associations was to provide an opportunity for close contact and collaboration to enhance the professional development of the members and to provide a forum for a discussion and possible solution of problems of mutual interest. Although certainly not a primary function, the associations, naturally, were interested in the welfare of their members, the opportunities for progression and the various policies of the company which governed their professional activity.

The mechanism of the association provides a means for discussing these problems, not only among themselves, but as a vehicle for presenting the views of its members and securing general information about a company's plans, its policies and its practices. In other words, the association is sometimes regarded by its members as a means of communication with the operating management of the company, although the individual members have no desire to have the association engage in collective bargaining on their behalf. Within many of these associations, there is a very strong and positive feeling that it is consistent with their professional status that the association express the common view of the members and make suggestions and recommendations and also make inquiries with respect to company plans and policies, but that it is inconsistent and contrary to the members' professional status for the association to function as a labor union and engage in collective bargaining.

The difficulties with respect to the present law stem from the fact that although these associations have no desire to function as labor organizations, the statute is now so drafted that if the association should be deemed to be dealing in any way with an employer with respect to working conditions, wages, or hours, it might be construed as a labor organization under Section 2 (5) notwithstanding its firm desires to the contrary. A number of managements which might believe the communication function served by the association to be beneficial as improving two-way communications with engineers, have feared that broad or specific discussions of company policies and practices would lead to charges that the company was dominating a labor organization because supervisory personnel are members of the association. They have, therefore, upon advice of counsel, instructed their supervisory personnel to refrain from participating in the activities of the associations with respect to professional matters if they involve economic status or conditions of employment of members.

This, of course, has the effect of preventing the association from performing a role which the membership feels it should properly perform. In addition, it has the effect of frustrating what could be more effectively developed as a means of two-way communication and participation between operating management and their professional group. As noted above, the engineers in these associations do not desire to have these association function as a union or to have it function for purposes of collective bargaining. However, the existing law exposes the associations to the danger of being deemed to be a union and to being company-dominated.

It is respectfully submitted that associations of professional people should not be compelled to make the choice between functioning as a union on the one hand, or of taking no common interest or concern in professional matters which may involve economic problems or conditions of employment. If these associations desire to function as advisory in character, or merely as means of communicating the consensus of the thought of their members, they should be privileged to do so without running the risk that the Government would order them disestablished.

A very serious result of this situation is the enforced stratification of the engineering profession. It is believed to be inimical to the interests of the great majority of professional employees, and the interests of the country, to continue legislation which exerts strong pressure fostering such a stratification of a major profession. It is also believed that this condition is an inadvertent effect of the law, and not the intent of Congress.

Several methods of amending the law to meet this problem have been considered. We have concluded that there are several alternative possibilities worthy of consideration, and perhaps others which have not occurred to us but which the experts in the field of labor law may find to be preferable. One suggested approach would be to amend Section 2 (5), defining the term "labor organization" to make it clear that an association or organization of professional personnel of the type previously described should not be deemed to be within the purview of the definition. An alternative approach which has been suggested is that Section 14 (a), permitting supervisors to join labor organizations, be broadened to permit professional personnel with supervisory duties to participate in professional associations comprised of both supervisory and non-supervisory professional people.

We have no desire to suggest that the safeguards incorporated in the present law against interference with or domination of collective bargaining agents be diminished in any way. We do not think, however, that it is necessary and certainly not desirable to have a technical provision in the law frustrate what is no more than an effort at joint communication and does not, in fact, constitute collective bargaining in the sense which Congress had in mind in passing either the Wagner Act or the present Labor-Management Relations Act of 1947.

We believe that freedom of association can and should be protected under the law, whether in unions or out, and that the purposes of the professional associations in our country should not be impaired in the manner in which we have related in this testimony.

We appreciate this opportunity to appear before the Committee and present our thinking on this important subject, and we stand ready to cooperate with the Committee in any way possible.—***End.***